REPORT TO THE SASKATCHEWAN DEPARTMENT OF HEALTH

FOR

A PROVINCE-WIDE DIAGNOSTIC IMAGING REVIEW AND FRAMEWORK FOR STRATEGIC PLANNING

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We would also like to thank the Diagnostic Imaging Steering Committee for their input insight and guidance during the project.

While there are issues identified within the report, we feel it is important to note that there are many positive aspects in the delivery of medical imaging services in the province including a high commitment to patient-focused care and a province-wide desire to work with one another to improve the current environment in order to provide the optimum care for Saskatchewan residents. Terms of Reference and membership for the Diagnostic Imaging Steering Committee (DISC) are provided at the end of the report.

Your assistance has been most appreciated and it has been a privilege to be part of this process.

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EXECUTIVE SUMMARY

The radiological sciences have seen a period of unprecedented growth in technical capability in the last three decades. As the pace of technological expansion slows there is greater emphasis being placed on the fusion of technologies (PET-CT and CT-MRI) and on imaging molecular processes and disordered function. This parallels the changing paradigm in medicine as molecular biology and genomics promise to alter medicine in radical ways. At the same time image-guided and minimally-invasive treatments make interventional radiology a potential solution to the need for more patient-friendly, not to say less resource-intensive, methods of delivering care.

In Saskatchewan, as in much of Canada, the infrastructure of care has suffered in the past from insufficient funding. This is, therefore, a decisive time at which to examine the need to redevelop imaging and the radiological sciences in the Province. Moreover a plan for this redevelopment needs to encompass not only patient care but the issues of human resources, education in a knowledge-intensive specialty, and the academic mission and not capital investment alone. The movement to an electronic medical record encompassing information systems and image recording and transfer makes a compelling case for any plan to be Provincial in scope. Saskatchewan Health is commended for their initiative and leadership in undertaking a comprehensive review and developing a strategic planning framework in diagnostic imaging at this time.

At the same time the contemporary growth in imaging and the fraction of the health care budget spent on the radiological sciences is stressing the system not only nationally but on this continent and, indeed, world-wide. In Canada this translates into ensuring the long-term sustainability of the Medicare system. To realize the future expanding potential of imaging within a funding envelope that, while growing at present, cannot hope to keep pace with change and expectations is a concern to anyone who administers, or thinks deeply about, the future of health care and the role of radiology within it.

To provide a framework for the stakeholders – technologists, managers, clerical staff, physicians, scientists, administrators and Government – to initiate a broadly based strategic planning exercise this Report has been developed through the work of a Provincial Steering Committee in collaboration with external consultants. The Report sets out to do the following:

- To provide an analytical overview of the distribution of imaging services in the Province
- To inventory the scale of imaging services delivered at present
- To examine the present and potential methods for remuneration and demand management
- To inventory the capital infrastructure (55% of the 380 imaging devices in the Province are over 10 years old)
- To examine human resource factors
- To consider the scale of Provincial wait-lists, benchmark these against other jurisdictions and consider improved methods for their management
- To examine governance within the system and identify models for improved communication and collaboration
- To derive a set of issues to be addressed in strategic planning, and
- To identify order-of-magnitude costs that will be required to effect change and re-development.

In the process of developing the Report in its several iterations the following high-level recommendations have already emerged, with the development of these and other plans to be the charge of the pluralistic strategic planning process. It is recommended that:

1. THE SASKATCHEWAN DIAGNOSTIC IMAGING (DI) NETWORK BE IMPLEMENTED AS THE PREFERRED OPTION OF THE STEERING COMMITTEE (MODEL #1);

2. COMMUNITY AND HOSPITAL-BASED SERVICES BE MORE COORDINATED;

3. KEY INDICATORS OF SYSTEM PERFORMANCE BE IDENTIFIED;

4. WAITING LISTS BE MONITORED PROVINCIALLY;

5. SHARED PROTOCOLS (HIGH TECHNOLOGY) BE DEVELOPED;

6. APPROPRIATNESS GUIDELINES BE REVIEWED, WHERE APPROPRIATE ADOPTED AND THEIR USE AUDITED;

7. A HUMAN RESOURCE STRATEGY FOR THE PROVINCE IN THE CONTEXT OF DI BE DEVELOPED;

8. OPPORTUNITIES FOR AN EXPANDED ROLE FOR TECHNOLOGISTS BE EXPLORED PROVINCIALLY;

9. PROVINCIAL BENCHMARKS AND QUALITY INDICATORS BE DEVELOPED AND APPLIED TO CONTINUOUS IMPROVEMENT THROUGHOUT THE SYSTEM;

10. COMMON PROCEDURE MANUALS BE DEVELOPED FOR USE THROUGHOUT THE PROVINCE;

11. AN INVENTORY OF CAPITAL ASSETS BE DEVELOPED AND UPDATED ON AN ANNUAL BASIS;

12. A PLAN IS DEVELOPED TO REPLACE EQUIPMENT AT APPROPRIATE INTERVALS IN THE PUBLIC AND PRIVATE SECTORS;

13. A PROVINCE-WIDE RADIOLOGY INFORMATION SYSTEM (RIS) / PICTURE ARCHIVAL AND COMMUNICATION SYSTEM (PACS) BE PLANNED AND IMPLEMENTED AS PART OF THE ELECTRONIC MEDICAL RECORD (EMR);

14. ACCESS TO THE EMR SHALL BE AVAILABLE TO STAKEHOLDERS IN ALL PARTS OF THE HEALTH CARE SYSTEM;

15. TRANSPARENT AND COMMON METHODS OF REMUNERATION FOR THE ENTIRE PROVINCE BE DEVELOPED IN COLLABORATION WITH THE SASKATCHEWAN MEDICAL ASSOCIATION (SMA);

16. REMUNERATION INCLUDE PAYMENT FOR ACADEMIC AND ADMINISTRATIVE ACTIVITIES;

17. SELF-REFERRAL BE DISCOURAGED IN ANY CONTEXT.

In these contexts the importance of ongoing communication between all those involved both in service delivery and administration must be recognized.

1.0 PROVINCE-WIDE DIAGNOSTIC IMAGING REVIEW AND FRAMEWORK FOR STRATEGIC PLANNING

1.1 MANDATE

Saskatchewan Health has requested a review of current diagnostic imaging (DI) services[i] in the province and, in addition, advice on the design and implementation of a DI framework for province-wide strategic planning.

The review is to include:

- an assessment of current and optimal organization of fee-for-service (FFS) and public hospital-based DI services;
- an assessment of provincial delivery and management initiatives, recent and current, as well as national and international best practices;
- consideration of issues in human resources (HR), remuneration, and demand management (DM);
- identification of priority areas;
- development of a framework for strategic planning to address public, provider, and government concerns, within the resources of a publicly-funded health care system;
- recommendations; and
- an implementation plan that provides a sustainable long-term strategy to improve and maintain fair and equitable access to DI in Saskatchewan.

1.2 PROCESS

An understanding of the existing DI environment in Saskatchewan was established, through examination of background information from payers and care providers; surveys of physicians who use DI services, administrators, providers (radiologists and nuclear medicine physicians predominately), and frontline technical staff; interviews with various stakeholders; and focus group meetings with physicians and administrators. Development of an inventory and a general assessment of equipment (DI and information systems) was completed, reporting on locations of existing equipment and infrastructure, workload volumes, HR, organizational structures and inter-relationships among them (including public and FFS-based), and general financing of the system. Reimbursement methodologies were explored.

An analysis of best DI practices in other jurisdictions was undertaken, particularly related to DM strategies, incentive models, HR strategies and practice models. A review of the Saskatchewan picture archiving and communication systems (PACS) / radiology information systems (RIS) initiative was also undertaken, including examination of organizational requirements, strategic directions, and integration into a provincial plan for Diagnostic Imaging. In addition, other relevant internal and external initiatives and factors were examined. These activities resulted in a clear understanding of the issues relating to DI services in Saskatchewan.

[i] For the purposes of this review, the term “diagnostic imaging” includes plain film radiography, ultrasound, nuclear medicine services, computerized tomography (CT), and magnetic resonance imaging (MRI).

1.3 TIMELINE

Submission of a final report with recommendations was requested for late November 2004. The recommendations were to address the most immediate DI concerns, to provide strategic direction to provincial stakeholders, and to propose an implementation plan to guide a province-wide DI strategy.

2.0 DI REVIEW (PUBLIC AND FEE-FOR-SERVICE)

2.1 BACKGROUND

History of Radiology

Radiology is unique among medical specialties in that it is possible to trace its origins to a precise moment in history. Professor Röntgen was a professor of physics at the University of Wurzburg in Germany when he discovered X-rays on November 8th, 1895.[1] This finding, and that of Becquerel who was to discover radioactivity in early 1896, were forever to change the practice of medicine.[2] Röntgen was awarded the first Nobel Prize in physics in 1901.[1]

Many scientists, professional and amateur, had apparatus in their laboratories which was similar to that used by Röntgen. They were immediately able to repeat his observations and many made their equipment available to clinicians.[1,3-5] At Dartmouth College in New Hampshire, Edwin Frost, a professor of astronomy, was asked by Gilman Frost (his physician-brother) to radiograph a patient. The resulting image of the left forearm (exposure time 20 minutes) was made on February 3rd, 1896, and was the first radiograph to be made in North America. In Montreal, a young man had been shot in the leg in a brawl on Christmas Eve 1895; several surgical explorations failed to locate the bullet. His surgeon took him to John Cox, Professor of Physics at McGill University, on February 7th 1896 and a radiograph was made, the exposure taking 45 minutes.[6] The bullet was found lodged between the tibia and fibula and was successfully removed. The film was subsequently used in court -- probably the first use of radiography in jurisprudence.[6]

Thus, within a couple of months of its discovery, radiography was being used in several places in the English-speaking world, although a translation of Röntgen's paper had only appeared in the journal Nature on January 16th, 1896.[4] Few discoveries have been adopted into medicine so quickly.

Pioneers

As the scope of radiology expanded, physicians specialized, often combining radiology with physiotherapy and other therapies. They practiced in a part of the hospital sometimes called the “electrical pavilion." At that time, radiology embraced both diagnostic radiology and radiation oncology (originally called therapeutic radiology).

Ultimately, radiology differentiated into diagnostic radiology and radiation oncology for the purposes of clinical practice and organization of the specialists. Donizetti has attributed the origins of nuclear medicine to Rutherford's work at McGill University,[2] although credit is more often given to Georg von Hevesy, whose tracer principle is fundamental to the use of radionuclides in medicine.[7] It was the availability of diagnostic radionuclides after the Second World War, especially I^{131} and later Tc^{99m}, that facilitated

the emergence of the third clinical specialty of the radiological sciences, nuclear medicine.

Perhaps the most notable physician of his time, Sir William Osler, was prompted to use X-rays experimentally in 1896. He embedded some gallstones in a beefsteak and made radiographs of it to see if the gallstones were detectable. The result was negative (we now know that only a small proportion of gallstones are opaque to X-rays).[8] At the turn of the 20th century, there were no specialties in medical practice; much early radiography was carried out by physicists or even by photographers.[3,4,8]

Bone, soft tissue, and dense foreign bodies provided the only contrast among materials in early radiography. Soon an orally administered contrast agent (bismuth nitrate, replaced a decade later by barium sulphate) was given to allow examination of the digestive tract.[9] After much experimentation, an intravenous (IV) contrast agent was developed and, in 1927, it was marketed for urinary tract radiography (*Uroselectan*, Schering AG).[9]

For the first seven decades of X-ray technology development, progress was determined by technical feasibility.[10] Important advances included the development of a reliable Coolidge tube, permitting shorter exposure times (1913); grids by Bucky and moving grids by Potter; conventional tomography by Ziedes de Plantes (1921), among many others; and cerebral angiography (1927) by Dr. Egas Moniz. Dr. Werner Forssmann was the first to place a catheter in the heart (his own).[3,10] A memorial to X-ray martyrs stands in Hamburg, Germany, illustrating the price paid for this inventiveness.[1,3-5].

Technological Explosion

Radiological diagnosis is now often referred to as “imaging,” reflecting its expansion beyond X-rays. Nevertheless, the evolution of the radiological sciences has led to more profound changes than a simple multiplication of tools and the development of “imaging.” Early radiology was rooted in morphology, chiefly skeletal morphology. Beginning with nuclear medicine, powerful technologies have been developed to allow examination of functions in the body, increasing capacity beyond the imaging of structures to the imaging of disease. As a consequence, a bewildering number of acronyms describing new techniques have emerged, e.g., computed tomography (CT), magnetic resonance (MRI), positron emission tomography (PET), single photon emission computed tomography (SPECT).[11-17]

Radiology is now in a medical-scientific phase, which began with Hounsfield and Cormack's invention of CT. Thus also began the imaging transition from analogue to digital. However, there are unifying features of these techniques.

a) Initially, radiological images were two-dimensional representations of three-dimensional tissues or organs. Newer imaging methods are sectional and reveal internal structure slice by slice much as the slices of a loaf of bread, quite apart from their convenience, also reveal the internal structure of a loaf.

b) High capacity microcomputers are used to reconstruct images from complex data sets. The massive computational tasks involved in image reconstruction in PET, CT, SPECT, and MRI would not otherwise be possible.

c) Another group of technologies also uses computer image processing but does not yield sectional data, e.g., digital subtraction angiography and magnetic resonance angiography.

Computers have had an impact that goes beyond changes in the technology of imaging disease. The results have been advances in the handling of digital data.

a) Digital radiography: Techniques have now been developed for digital rather than photographic recording of conventional X-ray images. The investment may be offset in part by savings in film purchase and storage, but more importantly by efficiencies in film retrieval by other clinicians and process re-engineering. Digital images will provide more latitude in exposure and some potential for image processing, e.g., edge enhancement.[1]

b) Information systems (IS): Hospitals have generally been slow to adopt modern IS. This has led to limitations in radiology departments where 80% of the data bits produced in a typical hospital are generated. Adoption of IS means there will be fewer radiographs lost, and shorter waits related to film handling and image transmission, both locally and by telemetry. Computer-assisted film interpretation and decision support are already on the horizon and will be readily introduced into the innovative, computer-dependant world of modern radiology.

It is important to distinguish between the use of radiology techniques as tools to study mechanisms of disease and use in a hospital or clinic to diagnose and follow an individual patient's illness. It is sometimes argued that certain radiological methods might serve only for research; more likely all of these tools will have a clinical role but degree of dissemination outside major and academic institutions will vary.

The Future

Radiology currently plays an important role in supporting medical diagnosis with interventional techniques that allow image-guided biopsy, drainages, and treatments such as catheter-based cerebral aneurysm ablation and radionuclide therapy. Thus, while the creation or use of images of internal structures plays a part in radiological practice, images are neither a necessary nor sufficient part of radiology to define its entire practice. Since this sub-specialty of interventional radiology is patient-friendly compared with traditional surgical methods (often requiring very short hospital admissions or none at all) it may also be important in addressing some of the political imperatives in the provision of health care, namely less costly practices.

There is not an inexhaustible range of physical energies available with which to image the body or treat disease. Indeed, the next two decades may see less radical change and instead the wider application and better understanding of the roles of existing technologies. However, other developments taking place in radiology include: electrical impedance imaging, optical imaging, electron spin resonance diagnosis and magnetic source imaging (magneto-encephalography).

The use of "screening" or case finding by CT or other techniques, and the capacity of the system to assess and pay for newly evolving technology are public policy issues that have yet to be adequately debated by Canadian society.

A modern DI department, particularly in an academic setting, is staffed by computer scientists, engineers, medical physicists, nurses, physicians, porters, radiopharmacists, secretarial staff, and technologists – all specialized in the use of particular technologies and equipment. In planning for the future, the availability of people with necessary skill sets may be as limiting as the capital and operating costs involved.

Conclusion

While the evolution of DI technologies will continue, issues of health care policy are becoming central to the future of the radiological sciences, such as the issue of appropriateness. The assessment of new technologies must be rigorous but technological nihilism must be avoided. Radiology has the potential to contribute to solving some of the issues in patient care and education, particularly in providing patient-friendly, cost-effective diagnostic and treatment procedures. Funding radiological methods in the future may come to be seen less as a resource-intensive burden and more as a strategic solution to delivering efficient care.

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2.2 GOVERNANCE AND ORGANIZATIONAL STRUCTURES IN SASKATCHEWAN'S HEALTH SYSTEM

In Saskatchewan, the Final Report of the Commission on Medicare, April 2001, recommended a new, regionalized model of governance and management of health care services in the province. "The Regional Health Services Act" was proclaimed on August 1, 2002, resulting in the merging of 32 health districts into 12 regional health authorities[ii] (RHAs). The Act established the RHAs and set the framework for the relationship between the Minister and each RHA. Further mechanisms to link RHA goals with those of the Department of Health include operational planning and budget development as well as an accountability document that links service and program expectations and outcomes to funding levels. Each of the RHAs is governed by 12 members appointed by the Lieutenant Governor in Council, pursuant to Section 3(1) of "The Regional Health Services Administration Regulations". *See Appendix 1 – Map of Regional Health Authorities.*

Major areas of responsibility of RHAs are:

- hospitals;
- health centres, wellness centres, and social centres;
- emergency response services, including first responders and ambulance services;
- supportive care, such as long-term care, day programs, respite, palliative care, and programs for patients with multiple disabilities;
- home care services;
- community health services, such as public health nursing, public health inspection, dental health, vaccinations, and speech pathology;
- mental health services; and
- rehabilitation services.

Hospitals are grouped into five categories based on the level of acute care services provided[iii], with the exception of the provincial psychiatric hospital in North Battleford and the rehabilitation centre in Regina. The two hospitals in Regina and the three in Saskatoon are defined as Provincial Hospitals. The hospitals in Prince Albert, Moose Jaw (populations 30,000 to 40,000), are defined as Regional Hospitals-Level 1, and in Lloydminster, North Battleford, Swift Current and Yorkton (populations 15,000 to 30,000) as Regional Hospitals-Level 2. There are nine District Hospitals (communities with populations of 3,500 to15,000) and 44 Community/4 Northern Hospitals (communities with populations <3,500). Table 1 outlines the facilities in each health region.

Table 1 - Number of Facilities in each Saskatchewan Health Region

Region	Provincial Hospital	Regional Hospital	District Hospital	Community and (Northern Hospital)
Athabasca				(1)
Cypress		1		4
Five Hills		1		3

[ii] Athabasca, the thirteenth region, is a partnership involving First Nations, Federal and Provincial authorities.
[iii] *Appendix 2 – Hospital Classification System and Appendix 3 – Hospital Services in Saskatchewan.*

Heartland			1	6
Keewatin Yatthe				(2)
Kelsey Trail			3	3
Mamawetan Churchill River				(1)
Prince Albert Parkland		1		3
Prairie North	Plus one Psychiatric Hospital	2	1	4
Regina Qu'Appelle	2 Plus one Rehab Centre			7
Saskatoon	3		1	6
Sun Country			2	3
Sunrise		1	1	5
Total	**5 plus two Provincial Facilities**	**6**	**9**	**44 + (4)**

May exclude smaller health facilities not listed in the Health Action Plan (Nov 01).

In addition to the creation of RHAs, the Final Report of the Commission on Medicare included the following recommendations pertaining to specialized care:

- province-wide planning for acute and specialized services led by government, including HR planning, bed management, construction and maintenance of buildings, and purchase and maintenance of equipment;
- standards for the delivery of specialized services established by Saskatchewan Health based on recommendations from a Quality Council;
- management of specialist services by RHAs with specialists on contract;
- concentration of tertiary services in Saskatoon, Regina, and Prince Albert as appropriate to population need with consolidation of some tertiary services in a single provincial location, or joint planning with other provinces for the delivery of services (Final Report, pg 33).

Regular planning forums are held in an effort to better plan and coordinate services, including a Minister's Forum with RHA and Saskatchewan Cancer Agency board chairs and a Leadership Council with the Deputy Minister of Health and Chief Executive Officers (CEOs) of the RHAs and the Saskatchewan Cancer Agency.

In 2003, the Province created the Health Quality Council (HQC) as an independent agency that measures and reports on quality of care in the province. It advises government, RHAs, and health care professionals on a wide range of issues related to health system quality and performance. Its mandate is to:

- develop evidence-based standards in health care delivery, including providing advice on the use of existing treatment options and identifying outdated or ineffective treatments;
- promote effective practices to professionals across the province;

- conduct research into the effectiveness of care and quality improvement initiatives;
- monitor and assess the performance of the health system including provision of advice on human resource needs;
- provide advice on appropriate drug prescribing practices;
- evaluate new technology, drugs and other clinical developments; and
- inform the public about the quality of health services in Saskatchewan.

The College of Physicians and Surgeons of Saskatchewan, through its Advisory Committee on Medical Imaging, provides leadership in the province in the areas quality standards in DI specifically in relation to the professional practice of radiologists and nuclear medicine physicians. The mandate of the committee is:

- establishing and maintaining quality standards of medical imaging services
- establishing and maintaining quality standards for the appropriate and proper use of medical imaging equipment
- inspecting and evaluating existing services and facilities as required
- reviewing manpower and equipment needs with respect to the provision of those services and facilities
- investigating and recommending mechanisms to prevent over-servicing and over-utilization of services in relation to overall costs
- facilitating continuing education of medical, allied professionals and employees with respect to medical imaging usage, procedure, hazards and safety, and advising on the credentialing of physicians providing medical imaging services.

2.3 STRATEGIC GOALS AND OBJECTIVES

The province articulates its goals and objectives through an annual planning cycle. Each year the goals and objectives are monitored for progress, publicly reported, and updated to reflect the objectives for the coming year. The goals outlined in The Action Plan for Saskatchewan Health Care for 2004/2005 are to:

- provide better access to health services, including primary, hospital, and emergency care;
- increase effectiveness to support good health and prevent illness;
- improve health workplaces and address shortages of key health providers; and
- place a greater emphasis on quality, efficiency, and accountability in order to ensure the long-term sustainability of the Medicare system (Sask Action Plan, 2004/05).

RHAs have adopted the goals expressed in the provincial Action Plan and are working to build upon the system-wide goals and objectives locally, within their own health areas. Included in this planning process are measurement indicators. Objectives are identified as short-term, medium-term and long-term. The RHAs, in turn, report to the Department of Health and to the public with respect to their strategic Action Plans and the extent to which they have achieved their objectives.

A review of regional Action Plans and interviews with stakeholders reveals the following objectives across RHAs, in relation to acute care and DI services:

- further investing in IS, electronic medical records (EMRs), equipment, technology, and infrastructure;
- increasing use of standardized measurement tools;
- providing seamless care within the region;
- maximizing the contributions of all team members;
- reducing waiting times;
- promoting and expanding Telehealth;
- recruiting additional clinical specialists, including radiologists in regional hospitals to support the introduction of new CT scanners;
- pro-active communicating to the public.

A review of strategic plans of DI departments and interviews with management personnel provides further specific objectives with respect to DI:

- setting standards of excellence in DI;
- establishing appropriateness criteria, clinical imaging protocols, and outcome expectations;
- disseminating strategic information aimed at better informing providers, students, and residents to optimally utilize imaging technology;
- promoting scientific inquiry for the advancement of clinical research, basic bio-medical research, technology assessment, and clinical practice guidelines (CPGs);
- committing to excellence and innovation with the support and resources necessary to enhance the quality of academic programs in the province.

2.4 DI SERVICES AND WORKLOAD

Saskatchewan provides a wide range of clinical programs to residents throughout the province. In order to support these clinical services, DI departments exist in all four categories of hospitals, as well as in a number of health centres. Services range from basic radiology in rural areas to state-of-the-art procedures such as CT, MRI, and lithotripsy in provincial hospitals. DI services are also provided outside the public system in eight regions, on a fee-for-service (FFS) basis -- the types and volumes of these services vary depending upon the size of the local population and its needs. DI services provided in FFS facilities will be described in section 2.4.2 of this report.

Table 2 – Overview of Services provided RHA and FFS by health region.

REGION	General Radiology*		Ultrasound		Special DI Procedures	
	RHA	FFS	RHA	FFS	RHA	FFS
Athabasca	1,440	0	0	0		0
Cypress	30,746	0	4,805	361		147
Five Hills	44,881	5,091	7,308	596		0
Heartland	29,862	0	3,003	0		0
Keewatin Yatthe	4,857	0	0	0		0
Kelsey Trail	30,257	0	5,232	2,659		1
Mamawetan CR	4,516	0	866	0		0
Prince Albert	35,889	0	2,953	3,947		0
Prairie North	52,339	19,860	6,919	10,100		100
Regina Qu'Appelle	188,727	94,477	23,076	42,398	7,609	6,057
Saskatoon	230,793	142,082	20,768	61,991	7,530	9,894
Sun Country	32,359	0	2,313	0		0
Sunrise	52,434	4	8,517	6,502		0
TOTAL**	**739,100**	**261,514**	**85,760**	**128,554**	**15,139**	**16,199**

* Includes plain film, fluoroscopy, CT, MRI, nuclear medicine, bone densitometry, lithotripsy and mammography

Hospitals and other public facilities within each region plan their workload annually in conjunction with their local health authority. The RHA provides each DI department with funds to cover operating costs, including supplies and salaries, for the technologists to perform examinations and for the physicians to provide the medical interpretation of the examinations.

Medically necessary DI services available outside public facilities are insured physician services under the Medical Care Insurance Act[iv]. DI service fees are made up of two components: a technical component to cover costs of performing the examination, and a professional fee to remunerate the physician for interpreting the examination. Some types of DI examinations can be performed in one geographic location and interpreted in another; hence the fees may be divided between two locations or even regions. There are also a number of special DI procedures that are insured physician services whether they be performed in hospitals or in FFS facilities.

[iv] Insured DI services are discussed in more detail in 2.4.2.

Table 3 - Cost of Providing DI services in Saskatchewan in 2003-2004[v]

	RHA	RHA		MSB	MSB	MSB	MSB	
Regions	Physician Compensation	Operating Budget		Ultrasound	General Radiology*	Special DI Procedures	MSB Only	Total RHA&MSB
Northern Regions	$2,411,468	$5,610,591		$1,251,194	$773,634	$6,398	$2,031,226	$4,442,694
Saskatoon	$8,641,839	$13,255,353		$4,353,962	$5,730,230	$864,463	$10,948,655	$21,897,310
Southern Regions	$2,044,704	$6,141,984		$503,030	$152,900	$7,866	$663,796	$2,708,500
RQRHA	$9,321,210	$11,364,882		$3,064,814	$3,554,439	$528,607	$7,147,860	$14,295,720
Totals	$22,419,221	$36,372,810		$9,173,000	$10,211,203	$1,407,334	$20,791,537	$79,583,568
RHA Total		$58,792,031		MSB Total			$20,791,537	

2.4.1 Public (RHA) Radiology

Provincial Totals for DI Services Provided by RHAs

In 2003/04, Saskatchewan Health spent $58,792,03[vi] on DI services in hospitals and health centres. The budget funded the operating costs for the DI facilities in all regions, plus the associated physician compensation, which together supported 839,999 examinations performed by an estimated 445 FTE technical and support staff. Table 4 provides an overview of the distribution of DI services performed in regional health authority facilities by region and modality.

NOTE: Some patients must travel beyond their own health regions to receive necessary care, including specialized DI services. Currently, RHAs report overall workload and do not track the specific services they provide to patients from outside their geographic boundaries. RHAs do not bill each other for the care they provide to the patients of other RHAs. In Table 4 and subsequent tables in section 2.4.1, reported volumes pertain to the DI services provided by an RHA, not the services consumed by an RHA's residents.

[v] The Medical Care Insurance Act Confidentiality Clause prohibits the disclosure of amounts paid under the Act to specified physicians. This table and others in this report provide data in aggregate form to comply with the Act.

[vi] Budget and workload information is from the Saskatchewan Health, Diagnostic Services Operational Planning Budget, 2004-2005 *(Appendix 4 – DI Workload '03/04; Appendix 5 - DI Budget '03/04;* and *Appendix 6 MSB Services and Costs)*.

TABLE 4 - Distribution of Services and Volumes (fiscal year 03/04)*

NOTE: Figures in parentheses represent the number of facilities within each region that provide each modality (FFS facilities excluded).

Facility	General Radiology	Ultra-Sound	CT	MRI	Vascular	Interventional Procedures	Nuclear Medicine	Bone Density	Litho-tripsy	Diagnostic Mammo-graphy	Total
Athabasca	1,440 (1)	0	0	0	0	0	0	0	0	0	1,440
Cypress	28,554 (11)	4,805 (1)	1,501 (1)	0	0	0	0	0	0	691 (1)	35,551
Five Hills	40,381 (8)	7,308 1)	1,662 (1)	0	0	0	0	0	0	2,838 (1)	52,189
Heartland	29,862 (16)	3,003 (6)	0	0	0	0	0	0	0	0	32,865
Keewatin Yatthe	4,857 (2)	0	0	0	0	0	0	0	0	0	4,857
Kelsey Trail	30,257 (9)	5,232 (2)	0	0	0	0	0	0	0	0	35,489
Mamawetan CR	4,516 (1)	866 (1)	0	0	0	0	0	0	0	0	5,382
Prince Albert Parkland	32,595 (10)	2,953 (1)	2,528 (1)	0	0	0	0	0	0	766 (1)	38,842
Prairie North	51,550 (12)	6,919 (3)	0	0	0	0	0	0	0	789 (1)	59,258
Regina Qu'Appelle	124,778 (12)	23,076 (4)	43,108 (2)	3,883 (1)	0	7,609** (2)	8,774 (2)	4,290 (1)	0	3,894 **(1)**	219,412
Saskatoon	162,947 (16)	20,768 (9)	34,204 (3)	8,849 (2)	5,731 (3)	1,799 (3)	14,943 (1)	9,313 (1)	537 (1)	0	259,091
Sun Country	32,359 (14)	2,313 (2)	0	0	0	0	0	0	0	0	34,672
Sunrise	49,968 (11)	8,517 (3)	0	0	0	0	0	0	0	2,466 (1)	60,951
Total	**594,064**	**85,760**	**83,003**	**12,732**	**5,731**	**9,408**	**23,717**	**13,603**	**537**	**11,444**	**839,999**

* This information was collected from the regions through the IT department's RIS and PACS initiative (excludes screening mammography).
** Includes both vascular procedures and interventional procedures.

The province's diagnostic services operational planning budget[vii] also contains resources for "other diagnostic services." These are services such as radiation oncology, the electro-diagnostic laboratory, non-invasive cardiology (e.g., echocardiography), the vascular laboratory, and respiratory services. In 2003/04, 169 FTE technical and support staff performed these services at an additional cost of $12,335,428.

For the most part, these services are beyond the scope of this review; therefore their financial and workload statistics have not been included. However, depending on the organizational structure of DI departments and their related budget structure, there could be a small percentage of these services that do relate to the diagnostic imaging services under review. For example, some procedures in the vascular laboratory might be incorporated in the diagnostic imaging category "special diagnostic procedures". Thus, the hospital funding for the procedure would be included in the vascular laboratory budget, but the additional physician compensation would be paid by MSB and discussed in section 2.4.2 of this report. It is not possible to break small segments of hospital funding out of the global Saskatchewan diagnostic services budget. Thus, the figures reported in this section could underestimate the hospitals' vascular and interventional procedure costs by a small margin.

Distribution of DI Services

RHAs provide vastly different mixes of clinical programs and diagnostic services according to the criteria set out in the Action Plan for Saskatchewan Health Care. The Action Plan specifies the minimum level of DI service that should exist in each class of health care facility.

Community, northern, and district hospitals are required to provide plain film radiography. Accordingly, this service exists in all regions. Regional hospitals are required to also provide fluoroscopy services. All regions except Athabasca, Keewatin Yatthe and Mamawetan Churchill River, provide fluoroscopy services, even though three of these RHAs do not have regional hospitals. Regional hospitals may offer additional, unspecified DI services, as required by the community they serve. Ultrasound services are provided in all regions except Keewatin Yatthe and Athabasca. Usually these services are provided in the highest level(s) of hospital(s) in the region, no matter whether they are classified as provincial, regional, district, community, or northern hospitals.

Many patients must travel for specialized services that are not available in their home regions. Mammography services are provided in six regions: Cypress, Five Hills, Prince Albert Parkland, Prairie North, Regina Qu'Appelle and Sunrise. These regions also participate in the provincial Screening Mammography Program, discussed in section 2.4.8 of this report.

CT scans are also available in only five regions: Cypress, Five Hills, Prince Albert Parkland, Regina Qu'Appelle, and Saskatoon. Swift Current, in the Cypress region, and Moose Jaw, in the Five Hills region, were sharing a mobile unit, but recently they have each acquired a permanently installed CT scanner. Prince Albert Parkland has one CT scanner in the Prince Albert Victoria Hospital. Regina has CT scanners in both its provincial hospitals and Saskatoon has scanners in all three of its provincial hospitals.

[vii] Saskatchewan Health, Diagnostic Services Operational Planning Budget, 2004-2005 (Appendix 5).

In December 2004, the Sunrise RHA will become Saskatchewan's sixth region to provide CT scan services.

The Action Plan specifies that highly specialised DI services such as MRI, interventional radiology, and nuclear medicine be localized in provincial hospitals. MRI services are available only in Regina and Saskatoon: Saskatoon has MRI services in both Royal University Hospital (RUH) and Saskatoon City Hospital (SCH) whereas Regina has MRI services only in the Regina General Hospital (RGH). Nuclear medicine is sited in one Saskatoon hospital, the RUH, and in both of Regina's provincial hospitals. Bone densitometry is also restricted to Regina and Saskatoon, Regina providing service at the RGH and Saskatoon at the RUH. Vascular and interventional procedures are performed in all five provincial hospitals and lithotripsy is provided at one site only, St. Paul's Hospital (SPH) in Saskatoon.

The following sections provide an overview of the clinical and DI services, as well as issues related to the delivery of the DI services, in each health region. Prior to regionalization, data collection was not standardized across the districts that are now contained within each region; therefore, some data inconsistencies may exist across regions and may be reflected in the following overview[viii,ix]

2.4.1.1 The Three Northern RHAs (Athabasca RHA, Keewatin Yatthe (KYRHA), and Mamawetan Churchill River (MCRRHA)

Saskatchewan's three northernmost regions are very sparsely populated with only 34,500 people living in a 269,000 square kilometre area, nearly one half of the province's landmass.[x] The MCRRHA has the largest population at 20,900 inhabitants, the KYRHA 11,300, and the Athabasca RHA 2,300. The people of northern Saskatchewan have distinguishing characteristics:

- They are relatively young. Thirty-seven percent of the population is under 15 years of age, compared with the provincial average of 20%.
- Northern Saskatchewan is growing. From 1998 to 2003, the number of inhabitants increased by 2.2%, compared with a provincial decrease of 3%. In the next 15 years the area is expected to continue to grow significantly,[xi] making it the fastest growing area of the province.
- The population is culturally diverse. In 2003, 84% of individuals indicated they were of Aboriginal ancestry, compared with the provincial average of 14%.

The regions' four northern hospitals provide general medical care and emergency stabilization 24 hours per day, 7 days per week. Minor, low-risk surgical and obstetrical services are available within the region. Five health centres are responsible for the delivery of primary health care as well as basic medical and emergency services.

[viii] Information in sections 2.4.1.1 to 2.4.1.11 was obtained from individuals within the RHAs and DI Departments, and from the websites of the RHAs.

[ix] Financial and FTE data shown in the "Imaging Statistics" tables are from audited information provided by Saskatchewan Health in their "Diagnostic Services Operational Planning Budget, 2004-2005" (Appendix 5). Workload data are the 2003-2004 "actuals" reported by the RHAs.

[x] Information in section 2.4.1.1A was taken from the Northern Saskatchewan Health Indicators Report 2004

[xi] From page 22, The Action Plan for Saskatchewan Health Care.

When residents of these regions require inpatient care or day surgery, more than 65% of the time they must travel south to hospitals in other RHAs: Saskatoon, Prince Albert Parkland, and, Prairie North. Historically all Athabasca residents travelled to other regions for care, but this will change as the construction of a new northern hospital has recently been completed. The advent of Telehealth at four sites has provided residents with video links to medical specialists, thus reducing their need to travel for medical consultations and education.

The regions' clinical programs are supported by DI services provided in the four northern hospitals. All three regions provide plain film radiography and MCRRHA also provides ultrasonography. Table 5 displays data for DI services for the three northern RHAs.

Table 5 - 2003/04 DI Data for the Three Northern Regions

RHA and DI Services	# of Exams	# of FTEs	03/04 Actual Cost ($)
Athabasca			
General Radiology	1,440*	2.0**	205,433
Keewatin Yatthe			
General Radiology	4,857	1.0	83,455***
Mamawetan Churchill River			
General Radiology	4,516	2.06	176,192
Ultrasound	866	In above	In above
Total	**11,679**	**5.06**	**465,080**

Note* These are based on the number of billing submissions.
Note ** Two combined laboratory-X-ray technicians (CLXT) share these positions with the laboratory.
Note***The KYRHA tracks the cumulative costs of Radiology and Laboratory services. These DI costs were estimated by the region.

The *Athabasca* region's DI facility, in operation only since July 2003, is situated at Stony Rapids and is furbished with digital equipment which is not yet being used to full capacity. At this time all films are printed and sent to the Saskatoon Medical Imaging Centre for reading; however an initiative is underway to submit the images electronically.

The *KYRHA* provides chest radiography and skeletal work, while all other examinations are booked at tertiary centres, generally Fort MacMurray, Saskatoon (orthopaedic cases), or Meadow Lake (obstetrics/gynecology cases). As there are no radiologists, interpretation is provided by radiologists in the Prairie North RHA.

The *MCRHA's* only DI services are available in the hospital at La Ronge. There is no radiologist, so images are sent to Prince Albert Victoria Hospital for reporting, an arrangement which is deemed satisfactory.

The regions' facilities provide DI services during the day Monday to Friday and on an on-call basis the remainder of the time.

DI Comments and Concerns for the Three Northern RHAs

The northern RHAs share concerns over the recruitment and retention of all types of health care professionals.[xii] All regions reported recruitment difficulties in the past and despite adequate DI technical staffing levels currently, this remains a major issue.

Since opening, the new hospital at Stony Rapids in the Athabasca RHA has experienced high staff turnover but the region reports that this has not yet caused patients to wait for DI services. The KYRHA reports that, although they have had some recruitment issues in the past, as of August 2004 they have had a full complement of DI technical staff with backup available. MCRRHA reports that while their current staffing is sufficient and stable, in the past they have experienced recruitment problems. To address their recruitment issues, this region trains their own staff.

There are no radiologists in the northern regions. Rather than attempting to recruit one, who would be required to cover a vast territory single-handedly, the hospitals have entered into service agreements with facilities in other regions. Currently films are printed and sent for interpretation, in the absence of electronic transmission.

There are no reports of patients having to wait for the basic radiology services provided in these three regions. In future, it is expected that demand will increase, along with the increase in the northern population and increases in physician numbers, e.g., two GPs have recently moved into the MCRHA.

2.4.1.2 Cypress Regional Health Authority (CRHA)

The Cypress region, located in the southwest corner of Saskatchewan, serves 46,000 inhabitants. The Level 2 regional hospital in Swift Current offers services in emergency, intensive care, general surgery and medicine plus core specialties. Four community hospitals provide general medical care, perform minor surgeries, and are equipped to treat and stabilize emergencies. Health clinics that are responsible for the delivery of primary health care also deliver basic emergency and medical services in this region.

Approximately one third of acute inpatient and day surgery admissions of CRHA residents are to hospitals outside the region. Most of these admissions (approximately 90%) are split between hospitals in Saskatoon and Regina. The regional hospital in Swift Current provides general radiology,[xiii] ultrasonography, diagnostic and screening mammography, and CT scans performed on a mobile unit shared between CRHA and the Five Hills RHA. The mobile unit has just been replaced by a fixed unit in each of the two RHAs, which will allow for an increase from 1500 to 4000 CT examinations per year. The four community hospitals and seven health clinics provide general radiology services only. Table 6 displays data for DI services for the CRHA.

Table 6 - 2003/2004 DI Data for the CRHA

DI Services	# of Exams	# of FTEs	03/04 Actual Costs ($)
General Radiology and Fluoroscopy	28,554	19.41	

[xii] KYRHA 2003-2004 Annual Report.
[xiii] General radiology includes plain film radiography and fluoroscopy, unless otherwise indicated.

Ultrasound	4,805		
CT Scanning	1,501	1.25	
Diagnostic Mammography	691		
Total	**35,551**	**20.66**	**1,465,436**

The regional facility offers day and evening coverage for general radiology, day coverage for ultrasound Monday to Friday, and CT coverage three days per week. On-call coverage is provided for general radiology services only.

DI Comments and Concerns for the CRHA

The sole radiologist, who provides coverage 90% of the time, is extremely busy. His workload is expected to increase even further now that the fixed CT scanner is installed and there will be a substantial increase in the number of CT examinations.

Recently staffing has been stable; however in the past the region struggled with staffing concerns, both the retention of existing staff and the recruitment of additional staff (e.g., at one point it took 18 months to recruit a medical radiation technologist). Younger technologists have reportedly left Saskatchewan for more attractive compensation packages in other provinces.

The region reports that patients do not have to wait for general radiography or mammography but they wait from four to five weeks for ultrasound tests and six to eight weeks for CT scans. For patients referred to other regions for MRI, nuclear medicine, and bone densitometry, wait times are perceived to be too long.

The region reports that additional funding would allow them to better utilize existing technology in innovative ways. The persistent shortage of funds does not allow for adoption of emerging technologies, e.g., the local foundation had to fund a workstation to allow interpretation of CT images from the new scanner.

It should be noted that Sask Health has recently funded the purchase of three new six-slice CT scanners, one each for Cypress Regional and Moose Jaw Union hospitals, and the Yorkton Regional Health Centre. On their own initiative the hospitals have raised funds to upgrade to ten-slice CTs.

2.4.1.3 Five Hills Regional Health Authority (FHRHA)

The Five Hills Region is located in south-central Saskatchewan and serves a population of 55,246 people. The Level 1 regional hospital, located in Moose Jaw, provides services in emergency, intensive care, and general medicine and surgery, as well as core specialty services. Three community hospitals and numerous health centres also contribute to the region's medical and emergency services.

Nearly 30% of acute inpatient and day surgery admissions of FHRHA residents are to hospitals outside the region. By far the largest portion (75%) is admitted to hospitals in Regina and nearly 20% to hospitals in Saskatoon.

The Moose Jaw Union Hospital (MJUH) supports the region's clinical programs by providing general radiology, fluoroscopy, ultrasound, mammography and CT scans provided on a mobile unit shared with Cypress RHA. This unit has just been replaced

with a fixed CT scanner and which will support an increase from 1,600 to 4,000 examinations annually. The regional hospital also performs a small number of interventional, biopsy, and hook-wire procedures. The three community hospitals and four health centres provide general radiology services only. Table 7 displays data for DI services for the FHRHA.

Table 7 - 2003/2004 DI Data for the FHRHA

DI Services	# of Exams	# of FTEs	2003/04 Actual Costs ($)
General Radiology and Fluoroscopy	40,381	21.20	
Ultrasound	7,308		
CT Scanning	1,662	1.35	
Mammography	2,838		
Total	**52,189**	**22.55**	**1,931,465**

MJUH provides DI service seven days per week with on-call coverage beyond regular hours. All other centres provide weekday coverage and 24/7 stand-by services.

The region has a two-year contract with a group of radiologists who travel from South Africa to rotate one at a time for a period of one to three months through the MJUH radiology department. Most facilities in outlying areas send their films to MJUH for interpretation, except for the Rockglen and Assiniboia centres, which send films to Regina, and the Kincaid centre, which sends films to Swift Current.

DI Comments and Concerns for the FHRHA

Waitlists are monitored quarterly. Presently, there are concerns over the wait times for CT scans and ultrasound. The wait time for an elective CT scan is seven months, for ultrasound one month, for fluoroscopy one week, and for diagnostic mammography two weeks. Patients from this region are waiting for 12 to 18 months to access MRI services in other regions. Access issues are routinely recorded and discussed, the goal being to facilitate change resulting in better service for physicians and their patients. The FHRHA suggests that additional funding would allow them to hire more staff and produce higher volumes from existing technology. From April 2001 to August 2004 the region recorded 15 issues regarding access to DI services: five for ultrasound, four for CT, four for X-ray, and two for mammography.

FHRHA reports that recruitment and retention of qualified sonographers has historically been, and remains, a concern. This situation is expected to worsen in the future with the establishment of a private ultrasound service in Moose Jaw this past summer. It was reported at the focus group session in Moose Jaw that the RHA learned of the new service shortly after it opened when the operator contacted all sonographers employed at the Moose Jaw Union Hospital and offered them employment. It was suggested that this approach was unfair since the private operator offered wages in excess of the rates established under the collective agreement. A training program in Saskatchewan is seen as desirable to increase the supply of these professionals.

As a considerable number of patients are being referred to specialists and DI departments in Regina and Saskatoon, DI department managers expect there would be

great benefit from the implementation of RIS/PACS, including improved access to patient information, including images.

The sustainability of the arrangement with South African radiologists is questionable. While the physicians involved provide a very credible service they can hardly be expected to develop radiology, particularly interventional radiology, in a manner best suited to serve the long-term goals of the Province. Tax and other revenues from the physicians are, moreover, lost to the Province.

2.4.1.4 Heartland Regional Health Authority (HRHA)

Located in west central Saskatchewan, the Heartland Region covers 44,320 square kilometres and provides health care to a population of 46,200. Its largest facility is the district hospital in Kindersley, which provides services in general medicine, emergency stabilization, low complexity surgeries, and low risk obstetrics. Six community hospitals and a number of health centres (2 of these designated ER sites) also provide the region with medical and emergency services. Specialists in orthopaedic and obstetrics travel from Saskatoon to provide services in this region. Due to the limited clinical services in the region, all non-routine cases travel, usually to Saskatoon's hospitals. More than 60% of the inpatient and day surgery admissions of HRHA residents are to hospitals in other health regions.

The region's hospitals provide basic general radiology and ultrasound services to support acute care and primary health care delivery. Nine health centres provide general radiology services only. Table 8 displays data for DI services for the HRRHA.

Table 8 - 2003/2004 DI Data for the HRRHA

DI Services	# of Exams	# of FTEs	2003/04 Actual Costs ($)
General Radiology and Fluoroscopy	29,862		
Ultrasound	3,003		
Total	**32,865**	**10.23**	**780,574**

Acute facilities provide DI services on weekdays with on-call coverage the remainder of the time. The health centres provide weekday coverage with no on-call services. A radiologist visits the HRRHA on a bi-weekly rotation to provide DI interpretation and services. A large volume of films is sent to Saskatoon for interpretation; some are also sent to Swift Current and North Battleford.

DI Comments and Concerns for the HRRHA

The Heartland region reports that it currently has no shortage of DI technical staff. The average length of employment for DI staff is greater than 15 years and the turnover is less than 5%. There are no reports of patients waiting for the basic diagnostic procedures performed within the region; however, care providers report that patients are having to wait long times to access MRI, nuclear medicine, bone density and angiography procedures in other regions. They also suggest that their region could benefit from teleradiology.

2.4.1.5 Kelsey Trail Regional Health Authority (KTRHA)

The KTRHA encompasses an area of 47,400 square kilometres and serves a population of 45,700. Three district hospitals, three community hospitals, and five health centres provide general medical services, emergency stabilization, acute care for stable medical conditions, and surgeries and obstetrical procedures for patients deemed to be low risk. Key clinical services such as orthopedics, gynecology, and urology are provided by visiting specialists.

Approximately 40% of inpatient and day surgery admissions of KTRHA residents are to hospitals outside the region. Most of these admissions (75%) are to hospitals in the Saskatoon region but a significant number (20%) are to hospitals in the Prince Albert Parkland RHA.
Together, the hospitals provide general radiology and ultrasound services to support the clinical programs. Three health centres also provide some general radiology. Hospitals provide DI service during the day, with on-call coverage after hours. Table 9 displays data for DI services for the KTRHA.

Table 9 - 2003/2004 DI Data for the KTRHA

DI Services	# of Exams	# of FTEs	03/04 Actual Costs ($)
General Radiology and Fluoroscopy	30,257	15.63	
Ultrasound	5,232	2.0	
Total	**35,489**	**17.63**	**1,199,003**

Some of the radiology services at the KTRHA hospitals are linked to the RUH and SPH in Saskatoon, and the Victoria Hospital in Prince Albert. This combination of service is deemed satisfactory. Report "turn-around time" is from two to three days with an "alert" being issued when the diagnostic results are positive.

The region's sole radiologist, located in Nipawin, is reimbursed by MSB for ultrasound examinations performed there, as he owns and operates the ultrasound unit. The region pays the sonographer; however her salary is recovered from the radiologist billings.

DI Comments and Concerns for the KTRHA

Although people wait a week or less for most DI services, this may change as one radiologist has recently left the region. The remaining physician will travel to the DI sites on a rotational basis. The region reports that DI staffing is otherwise satisfactory. Relationships among health care facilities within the region are reported to be good, issues surrounding regional DI are easily discussed, and generally solutions are achieved through collaborative efforts. However, the region's ability to maintain its current level of professional coverage may be compromised in the future as a result of fragmentation of services between the public and private sectors, and in addition, the opportunity available in the private sector to capture volumes without regard to the needs of publicly administered services.

2.4.1.6 Prince Albert Parkland Regional Health Authority (PAPRHA)

The Prince Albert Parkland Health Region covers an area of 31,596 square kilometres and serves approximately 77,215 inhabitants. The Level 1 regional hospital, located in Prince Albert, provides services in emergency, intensive care, and general medicine and surgery, as well as core specialty services. Three community hospitals and some smaller integrated care centres also contribute to the region's medical and emergency services. More than 30% of PAPRHA residents who require hospital admission for acute care or day surgery are admitted to hospitals in other health regions. A very large percentage of these patients migrate to hospitals in Saskatoon.

The regional hospital supports clinical programs through the provision of general radiology, ultrasound, diagnostic and screening mammography, and CT services. The community hospitals and six care centres provide general radiology services only. Table 10 displays data for DI services for the PAPRHA.

Table 10 - 2003/2004 DI Data for the PAPRHA

PAPHR	# of Exams	# of FTEs	03/04 Actual Cost ($)
General Radiology and Fluoroscopy	32,595	5.21*	985,158
Ultrasound	2,953	1.5*	
Mammography	766	.5*	
CT Scanning	2,528	1.0*	179,445
Total	**38,842**	**14.19****	**1,164,603**

* Technical staff only

** Includes technical and other staff

The Prince Albert Victoria Hospital offers general radiology seven days a week with on-call coverage outside regular day and evening hours. CT, mammography, and ultrasound services are available during the day, Monday to Friday, with no additional on-call coverage. Currently 1.5 radiologists at the Prince Albert Victoria Hospital provide daytime coverage from Monday to Friday; however they do not provide call-back coverage. In addition to local work, the radiologists' reporting agreement includes coverage for nine rural and northern communities.

DI Comments and Concerns for the PAPRHA

Due to a change in the status Indian transportation funding policy, Prince Albert is seeing an increase in the number of status Indian residents coming to the region for treatment, creating additional workload. Efforts are being made to establish two full-time radiology positions, as it is particularly difficult to recruit and retain part-time physicians. The region reports difficulty recruiting both radiologists and technical support staff, although they have experienced staff turnover of only one person per year over the past three years. There have been three grievances over the past three years due to differences in interpretation of the collective agreement. Ultrasound and clerical staff have suffered from repetitive strain injuries and the department responded by introducing changes to prevent further injuries.

Waitlists vary by modality; patients must wait five months for elective CTs and as of late, they must wait for prostate ultrasound procedures. The PAPRHA believes that additional equipment would help the situation, but only if accompanied by sufficient funding to hire

additional staff to support the equipment and the radiologists. The region reports that patients are also waiting long times to access MRI, nuclear medicine, and bone densitometry services in other regions.

2.4.1.7 Prairie North Regional Health Authority (PNRHA)

This region serves a population of 71,545, the largest segment being ages 15 to 24 years and the smallest 65 years and older. Two regional hospitals provide emergency services, general surgery, internal medicine, pediatrics, obstetrics, gynaecology, intensive care, mental health care, and palliative care. The district hospital, four community hospitals and six integrated care centres complete the region's medical and emergency services. There is also a provincial psychiatric hospital located in North Battleford. Approximately 30% of the inpatient or day surgery admissions of residents in this region are to hospitals in other regions. Almost all of these admissions go to Saskatoon.

Twelve centres in this region provide DI services to support clinical programs. The regional hospital in Lloydminster offers general radiology and ultrasound services and the regional hospital in North Battleford offers these services plus screening and diagnostic mammography. The other hospitals and care centres offer general radiology services only. The region is in the process of purchasing a CT scanner. Table 11 displays data for DI services for the PNRHA.

Table 11 - 2003/2004 DI Data for the PNRHA

PNRHA	# of Exams	# of FTEs	03/04 Actual Cost ($)
General Radiology and Fluoroscopy	51,550	20.22 including clerical/porter	
Ultrasound	6,919	3.0	
Diagnostic Mammography	789	1.0	
Total	**59,258**	**24.22**	**1,951,331**

Note: Except for the hospital facilities, all other diagnostic sites provide basic radiology services during the dayshift only. This coverage is provided by 3.12 FTE's (in table as part of total FTE) estimated from combined Laboratory/X-ray hours.

North Battleford provides daytime services seven days a week plus on-call coverage, while Lloydminster provides day and evening services seven days a week plus on-call coverage. Lloydminster is in a special geographical position, lying directly on the border between Saskatchewan and Alberta. PNRHA operates the health services for all of Lloydminster with funding support from Alberta Health and Wellness through the East Central Region.

DI Comments and Concerns for the PNRHA

Even though current staffing levels provide timely service, the emphasis in the PNRHA 2003-2004 Annual Report is on the need to stabilize current physician specialist services and to recruit additional specialists for this region. The Annual Report also makes recruitment and retention of diagnostic medical and technical staff a key priority.
There are three radiologists in this region, two in North Battleford and one in Lloydminster. One of the North Battleford radiologists was recently recruited. Additional radiologist services will be required to support the CT scanner installation in December 2004 (radiologists in this region are on salary).

Historically most issues in this RHA have centred on waitlists. North Battleford residents were experiencing a one-month wait for non-urgent ultrasound services but improvement is now expected as an additional sonographer has recently been hired. At the same time, the expansion of a fee for service diagnostic facility in Lloydminster significantly improved access to ultrasound in that area and the wait list has virtually disappeared. In North Battleford, access to diagnostic mammography was also a concern, however, changes to radiologist scheduling has allowed some gain to be made and the wait times have been reduced to three weeks. The PNRHA suggests that an increased operating budget would allow them to increase staffing for ultrasound and further decrease patient wait times and innovative ways to reduce wait times further are being sought.

PNRHA reports that its patients are also experiencing long wait times to access CT, MRI, and nuclear medicine services in other regions. The new CT scanner should alleviate this problem to some degree.

2.4.1.8 Regina Qu'Appelle Regional Health Authority (RQRHA)

The RQRHA is the largest health care delivery system in southern Saskatchewan, providing a full range of health care services to its 245,000 residents as well as specialized health services to nearly half a million residents of southern Saskatchewan. The fastest growing segment of the region's population consists of First Nations people. It is expected that, overall, the population will remain relatively stable over the next 10 years, but its composition will change: the portion of the population over age 65 will increase and the portion under age 40 years will decrease. There is no expectation of significant migration effects in the future.

The two provincial hospitals, the RGH and Pasqua Hospital, provide general medical, surgical and emergency care, as well as a full range of specialized services. The region's seven community hospitals and numerous community health centres also provide general medical and emergency services. Only a few of the residents of this region (approximately 5%) receive inpatient care or day surgeries outside of their region.

The two regional hospitals support the region's clinical services with general radiology, fluoroscopy, ultrasound, CT, MRI, interventional procedures, nuclear medicine, bone density scanning, and mammography (MRI and bone density scanning are offered at RGH only). The community hospitals provide general radiology services and two of them also provide ultrasound. Table 12 displays data for DI services for the RQRHA.

Table 12 - 2003/2004 –DI Data for RQRHA

DI Services	# of Exams	# of FTEs	2003/04 Actual Costs ($)
General Radiology and Fluoroscopy	124,778	91.91	
Ultrasound	23,076	Included under Gen Rad	
CT Scanning	43,108	20.26	
MRI Scanning	3,883	6.41	
Interventional/Special Procedures	7,609	Included under Gen Rad	
Nuclear Medicine	8,774	24.32	
Bone Density Scanning	4,290	3.09	

Diagnostic Mammography	3,894	Included under Gen Rad	
Total	**219,412**	**142.7**	**11,364,882**

RQHR reports that there are 16 radiologists, 13 FTE (1 retiring Dec 2004); and 3 PT at 0.8, 0.6, and 0.4 FTE.

Facilities other than the provincial facilities operate during the day, Monday to Friday, and provide on-call coverage the remainder of the time. The Pasqua Hospital provides general radiology and CT coverage during the day and evening, seven days a week, with on-call service after hours. Ultrasound services are available during the day, Monday to Friday, followed by on-call coverage. The RGH provides general radiology coverage 24 hours per day, seven days a week. Ultrasound and CT services are available seven days a week with on-call services beyond regular hours. Coverage for special procedures, including angiography services, is available on weekdays and, when needed outside regular hours. Hours of operation for MRI are 0630 to 2230 hours, Monday to Friday and 730 to 1530 on Saturday, with the availability of staff.

DI Comment, and Concerns for the RQRHA

The RQRHA reports significant staff turnover in the past three years and anticipates the future will also present some staffing concerns, particularly amongst the technical staff (within four years, ten technologists will be eligible for early retirement). There are particular problems recruiting sonographers. Usually, they must be hired from outside the province, as the local clinical training program for sonographers no longer exists. There is also a concern that Saskatchewan might lose trained MRI staff to other provinces if the province fails to provide comparable compensation. There have been four grievances over the last three years, however most disputes are resolved before they reach that state.

Wait lists

The provincial hospitals function as referral centres for CT, MRI, mammography, nuclear medicine, bone densitometry, and interventional procedures including angiography, for the southern half of the province. DI departments report that they have started monitoring wait lists as the demand for CT, MRI, and ultrasound services cannot currently be met in a timely manner.

Examples of wait lists and wait times in RQRHA in July 2004:

- CT: 824 patients, which represents one week of workload, (based on a regional workload of 43,118 examinations in 2003/04), assuming no urgent or emergency cases were added. At that point, the average actual wait time was 3.5 weeks for non-urgent abdomen CT examinations, two weeks for non-urgent spine examinations, and six to eight weeks for non-urgent head examinations.
- MRI: In contrast, 2980 patients were on the MRI waitlist, almost eight months of work load based on a regional workload of 3854 examinations per year (2003/04).
- Ultrasound: 217 patients were waiting for ultrasound tests at RGH.
- Carotid (Doppler) examination: Four week waits
- Bone densitometry: 14 to 16 weeks
- PVI tests: 3 weeks
- Prostate (US) biopsies: 3 weeks

- Incompetent (US) veins: 7 weeks
- General radiology examinations: no waits
- Special procedures: no waits

Over the past three years, the region has tracked issues related to patient care and classed them according to the type of concern. There has been a steady increase in the number of issues related to access to diagnostic services (laboratory and DI), increasing from 30 in 2001/02, to 46 in 2002/03, and to 54 in 2003/04 (95% of all 57 access concerns recorded in the region).

Stakeholders agree that some equipment needs updating and that patient wait times could be reduced if additional funding were available to extend operating hours and increase examination volumes. This will be even more necessary in the future as the demand for DI will continue to rise. Even though the total population is expected to remain relatively stable, the portion of the population over 65 years old is expected to increase thus driving the demand for more health care services including DI services.

2.4.1.9 Saskatoon Regional Health Authority (SRHA)

The Saskatoon Health Region is the largest health region in Saskatchewan, serving 287,438 residents. The region provides not only a full range of health care services to residents in the region, but it also provides specialized care to residents in the northern half of the province. Saskatoon's three provincial hospitals, the RUH, SPH, and SCH, provide general medical, surgical and emergency care, as well as a wide range of specialized services. The region's one district hospital, six community hospitals, and numerous community health centres also provide general medical and emergency services. Few of the region's residents (approximately 6%) receive inpatient care or day surgeries outside of their region.

The region's provincial hospitals provide general radiology, ultrasound services, vascular procedures (angiography), and interventional procedures. Two of these sites (RUH and SCH) offer MRI, RUH offers nuclear medicine and bone densitometry, and SPH offers lithotripsy. All other hospitals and some health centres provide general radiography, and some provide ultrasound services. Table 13 displays data for DI services for the SRHA.

Table 13 - 2003/2004 DI Data for the SRHA

Saskatoon RHA	# of Exams	# of FTEs*	2003/2004 Actual Costs ($)
General Radiology and Fluoroscopy	162,947	90.63	
Ultrasound	20,768	9.34	
CT Scanning	34,204	10.07	
MRI Scanning	8,849	8.26	
Vascular Procedures	5,731	14.35	
Interventional Procedures	1799	Included under Gen Rad	
Nuclear Medicine	14,943	17.48	
Bone Densitometry	9,313	.29	
Lithotripsy	537	1.68	
Total	**259,091**	**152.10**	**13,255,353**

* Staff may rotate through various clinical areas to meet clinical demand.

Hours of operation for MRI services at Royal University Hospital are 0730 to 2400 hours Monday to Friday and 0800 to 1630 Saturday and Sunday. On call services are available outside regular working hours. Hours of operation for MRI services at Saskatoon City Hospital are 0730 to 1800 hours, Monday to Friday.

DI Comments and Concerns for the SRHA

The provincial hospitals serve as referral centres for the province by offering a variety of specialties, including DI. Being a referral centre creates its own set of issues, one being patient wait times. Waitlists are monitored continuously, as are "no-show" rates. In July 2004, the average "no-show" rate was 5.53% for CT and 1.05% for MRI.

Concerns regarding the length of waits for MRI, CT, nuclear medicine, and bone density examinations have been expressed. Examples of wait lists and wait times in SRHA:

- CT: There are currently 1439 patients waiting for CT scans, which represents two months of workload based on 8930 cases per year. The wait for urgent cases is 5 ½ weeks, for semi-urgent cases 11 weeks, and for elective cases 16 weeks.
- MRI: Presently there are 1956 patients on the MRI waitlist, which represents 6 months of workload based on 3,680 cases per year. Current waiting times for MRI are 10 working days for urgent cases, 7 months for semi-urgent cases, and 13-18 months for elective cases.
- Nuclear medicine scans: Residents in the northern half of Saskatchewan are reported to be waiting longer times to access nuclear medicine examinations, than residents in other provinces. In particular, for waits for cardiac scan procedures are: urgent cases 2 weeks, semi-urgent cases 12 weeks, and elective cases 40 weeks

Within the region there has been discussion about wait list issues and the potential to increase capacity. Many stakeholders believe that the existing resources are under-utilized and that more funding for additional staffing would go a long way. As a result, a proposal has been brought forward that would increase:

- MRI by 23%
- CT by 0.5%
- Ultrasound by 14%
- Nuclear Medicine by 2%
- Bone Densitometry by 2%
- Vascular/Interventional by 0.7%

Proponents of this proposal believe capacity could be increased through additional funding, which could be used to extend operating hours (most cases), purchase additional equipment, or recruit more staff in areas with critical needs. For example, the proposal states that an increase in ultrasound could be achieved by filling the 2.5 staff vacancies that have existed over the past 1½ years. The MRI increase will result from increased funding as announced by the Ministry. This will be a three-step implementation and will add 2,200 cases by the end of 2004. General radiology and lithotripsy will remain unchanged.

2.4.1.10 Sun Country Regional Health Authority (SCRHA)

Sun Country region, located in the south east corner of Saskatchewan, covers 33,239 square kilometres and serves a population of 55,049. The region's two district hospitals provide acute care services including medicine, obstetrics, paediatrics, surgery, coronary care, emergency, outpatient care, and day surgery. In addition, three community hospitals and 10 health centres provide general medical and emergency services. Due to limited clinical services in this region slightly more than half of the residents find it necessary to travel outside the region when they require inpatient hospital admission. More than 90% of these patients are admitted to hospitals in Regina.

The district hospitals, located in Weyburn and Estevan, provide general radiology and ultrasound services to support the region's clinical services. The community hospitals and nine health centres provide general radiology services only. Table 14 displays data for DI services for the SCRHA.

Table 14 - 2003/2004 DI Data for the SCRHA

DI Services	# of Exams	# of FTEs	2003/2004 Actual Costs ($)
General Radiology and Fluoroscopy	32,359		
Ultrasound	2,313		
Total	**34,672**	**10.7**	**665,618**

This region does not have any on-site radiologist coverage; all films are taken by bus or courier to Regina, where the Regina Radiologist Group provides interpretation. Positive results are faxed. Report "turn-around time" is considered reasonable. SCRHA management believe implementation of PACS would greatly improve service delivery.

DI Comments and Concerns for the SCRHA

The SCRHA DI departments have a full complement of technical and clerical staff. A sonographer who is employed by the Radiology Associates in Regina travels to the Sun Country region to perform ultrasound examinations two days a week. There have been no grievances but technologists are unhappy, some to the point of leaving. They have been 'red circled' i.e., their salaries have been frozen. There are mounting concerns about the ability of the region to recruit additional technologists when they need to replace those who are expected to retire in the near future. A successful recruitment strategy has been the provision of student bursaries with a return-of-service understanding.

Additional concerns:

- Some occupational health and safety concerns exist, primarily related to poor air quality.
- Patients must travel to Regina for gastric tests, as they are no longer performed in Weyburn or Estevan.
- There is a six to eight week wait for ultrasound examinations.

SCRHA reports that they would like to see increased availability of all specialised DI services in other regions, as patient wait times are becoming quite long.

2.4.1.11 Sunrise RHA

The Sunrise RHA encompasses 29,951 square kilometres and serves a population of 60,000. The Yorkton Regional Hospital (YRH) provides services in emergency, medicine, intensive care, obstetrics/gynaecology, paediatrics, and a wide range of surgical specialties. In addition, one district hospital, five community hospitals, and six community health centres provide medical and emergency services. Approximately 30% of the acute inpatient or day surgery admissions of residents in this region are to hospitals outside the region – most in Regina but some in Saskatoon. DI services at the YRH include general radiology, ultrasound, and diagnostic and screening mammography. By late 2004, CT and Doppler ultrasound services will be available. Hospitals in Canora and Melville provide general radiology and ultrasound services. Eight other facilities provide general radiology only.

General radiology services at the regional site are provided seven days a week with on-call coverage outside regular hours. Fluoroscopy tests must be scheduled on weekdays, based on the radiologist's availability. Ultrasound services are offered on weekdays, with on-call coverage outside regular hours. Table 15 displays data for DI services for the Sunrise RHA.

Table 15 - 2003/2004 –DI Data for the Sunrise RHA

DI Services	# of Exams	# of FTEs	Actual Costs ($)
General Radiology & Fluoroscopy	49,968	Included in total	
Ultrasound	8,517	Included in total	
Diagnostic Mammography	2,466	Included in total	
Total	**60,951**	**26.77**	**2,079,465**

DI Comments and Concerns for the Sunrise RHA

There has been no MRT turnover in the past three years, however, the region reports serious issues concerning the recruitment and retention of sonographers. Some occupational health and safety issues exist. In particular, there is a lifting issue at Langenberg, and at Esterhazy the darkroom and X-ray room require additional ventilation.

There is only one radiologist in the Sunrise region, which limits the number of ultrasound and fluoroscopic tests that may be performed. The sole radiologist provides full-time coverage at YRH and three to four hours of coverage per week at Esterhazy, as well as interpretation of films by mail for Langenberg and Foam Lake. YRH is in the process of recruiting a second radiologist to perform CT services starting later this year. The Sunrise RHA believes that additional funding would allow them to increase staffing and perform more ultrasound tests, recognizing that volumes would be limited by the availability of a radiologist.

There are patient access issues for musculoskeletal, vascular, and breast ultrasound examinations. Presently, there is a six-week wait for ultrasound examinations at YRH and a two week wait for fluoroscopic procedures in Esterhazy. In the past, patients have also had to wait for mammography services. Ultrasound-guided prostate biopsies are being referred to tertiary centres, usually in Regina. In addition, patients are experiencing waits for CT, MRI, nuclear medicine, and bone density tests, which are provided in other regions.

2.4.2 FEE FOR SERVICE DIAGNOSTIC IMAGING

2.4.2 Medical Services Branch (MSB) – DI Service Volumes

Services provided to patients in the province's hospitals and health centers are paid for by the regional health authorities which, in turn, are funded by the Saskatchewan Department of Health. Residents may also receive medical services outside public facilities from general practitioners and specialists. These medical services are usually insured under the Saskatchewan Medical Care Insurance Plan. Patients who are residents of the Province do not pay care providers directly; the physicians are paid on a fee-for-service (FSS) basis through the Medical Services Branch (MSB) of the Department of Health.

As of March 31, 2004 there were 1,662 physicians licensed to practice in the province and eligible to participate in the medical care insurance plan. The Physician Payment Schedule consists of approximately 3,000 different insured physician service fee code items. Services for performing, interpreting and reporting DI procedures are included in these insured physician services. MSB pays radiologists and other physicians such as ophthalmologists, obstetricians, gynecologists, and some general practitioners, for the roles they perform in the provision of DI services. Some of these services are delivered in regional health authority facilities but most of the services paid for by MSB are delivered outside regional health authority facilities. Various types of physicians also provide echocardiograms (reviewed in section 2.4.3).

Fee for service DI is provided outside regional health authority facilities in 8 of Saskatchewan's 13 health regions. Fee-for-service DI services range from simple ultrasound and general X-Ray examinations to more complex image-guided procedures. These services are distributed similarly to those provided in hospitals and health centers, i.e. services in very sparsely populated areas are basic and they tend to become more specialized as the area becomes more densely populated. Radiologists in Regina and Saskatoon, both provincial referral centers, provide the province's most complex DI work, some of which is paid on a fee-for-service basis. No MRI or CT examinations are performed on a fee-for-service basis; they are all performed in hospital settings.

Rural or northern health regions frequently provide no MSB insured DI services. Their residents have to travel to other regions to have their DI examinations performed and interpreted. Some health regions may have the facility, equipment and technologist to perform insured DI services, but the tests are sent to physicians in other regions for interpretation and billing. Regions with urban centers, such as Regina and Saskatoon, have the resources to perform and interpret even the most specialized DI procedures on a fee-for-service basis. Their residents have local access to the services that best meet their needs, whether publicly funded or MSB insured.

Table 16 shows types of MSB insured DI services occurring in each health region.[xiv]

A major limitation in MSB data is that patients may receive services in one locale, but the physician who interprets and bills for the service may be in another region. In these

[xiv] Note: statistical data presented throughout this section originated with Saskatchewan Medical Services Branch (MSB) and may be found in Appendix 6 – MSB DI 03/4 Services and Costs.

cases the physician billings will be reported in his or her region, not the region where the patient had the tests performed.

Another limitation in the data is that when a physician provides itinerant services to another health region for which a separate MSB billing account has not been established, the MSB billings cannot be classified as work done in the itinerant region. They will show in the region where the physician has his or her "home" account.

Finally, patients travel into health regions other than their own, in order to access the services that they require. Therefore, services within a region are provided to patients from many regions. This is no different than the pattern seen for hospital and other publicly funded health care services; patients migrate to the closest and most available sources that will meet their health care needs. Therefore, service volumes reported in this section are services provided (billed) in a region and were not necessarily received by patients from that region.

Table 16 – Fee-for-Service DI Services Provided in Health Regions

Health Region	Ultrasound	General Radiology*	Special Diagnostic Procedures
Athabasca			
Cypress	√		√
Five Hills	√	√	
Heartland			
Kelsey Trail	√		
Keewatin Yatthe			
Mamawetan Churchill River			
Prairie North	√		
Prince Albert Parkland	√	√	√
RQRHA	√	√	√
Saskatoon	√	√	√
Sunrise	√		
Sun Country			

* Includes diagnostic mammography

Fee for Service DI – Totals for Saskatchewan

In the fiscal year 2003 - 2004, MSB paid more than $20 million to physicians to provide insured DI services. More than $9 million was paid for ultrasound services; over $10 million for general X-Ray services, including diagnostic mammography; and more than $1 million for special DI procedures.

The table below shows the total number of each type of DI services paid by MSB in Saskatchewan in 2003-2004.

Table 17 – 2003- 2004 Total DI Procedures

Procedure Type	Total Billings ($)	# Services
Ultrasound	$9,173,001	128,554
General X-Ray	$10,211,204	261,514
Special Procedures	$1,407,334	16,199
TOTAL	$20,791,539	406,267

Special DI procedures funded by MSB, fall into 4 categories: angiography, transluminal angioplasties, invasive procedures and image-guided procedures. The table below shows the number of these procedures performed in the 03/04 fiscal year. All angioplasties and angiographies are performed in hospital settings. Image-guided procedures, including invasive procedures, can be performed either in regional health authority facilities or in non-regional health authority facilities.

Table 18 - Special DI Procedures: Fee-for-Service Billings 03/04

Procedure Type	Total billings ($)	# Discrete Patients	# Services
Angiography	$301,707	1,311	5,820
Invasive Procedures	$172,410	1,521	2,254
Procedures under fluoroscopic, CT or ultrasonic guidance	$828,334	5,182	7,444
Transluminal angioplasty	$104,882	258	681
Total	$1,407,334	N/A	16,199

Discrete patients are not additive.

MSB pays the professional fees for ultrasound and X-Ray only if the tests are performed outside a hospital. Therefore the number of exams and the costs for MSB insured services may be added to those performed within each RHA's publicly funded facilities to produce a total number and cost of DI services. Accounting for volumes of special DI procedures is not as simple and as a result, there is some overlap in the information presented in this section[xv].

[xv] The accounting for special diagnostic imaging procedures is not as simple. Most of these procedures take place in a tertiary care environment, with the hospital being compensated for the technical component through its RHA budget and the physician billing MSB for the procedure fee(s). The physician also bills the interpretation fee to the hospital, the same as for all other work he or she performs on site. The number of procedures is counted by the hospital, as well as by MSB, in the number of procedures it pays the radiologists. There is no one-to-one relationship between these counts. Each special procedure fee is not tracked in relation to a specific hospital "encounter" of care. Several procedures may be performed during what the hospital considers to be one "encounter" of care. In some instances, MSB may not be able to accept physicians' billings for these procedures e.g. there might be duplicate counts, which means that the MSB count may be lower than the radiologists' and the hospitals' counts. As a result, it is not possible to calculate the precise number of these procedures performed in public facilities and therefore not possible to identify the remaining balance that may be attributed to private imaging clinics.

The following tables present volumes of MSB funded DI services in each health region and also show where patients access these services outside their own health region.

2.4.2.1 Fee for Service DI in the Athabasca Health Region

Residents of Saskatchewan's most northerly health region have no MSB insured DI services and find themselves travelling south, primarily to Prince Albert Parkland and Saskatoon health regions to access FFS DI services.

The table below shows the regions that provide fee-for-service DI services to residents of Athabasca Health Region.

Table 19 – DI Services Provided to Residents of the Athabasca Health Region

Provider Health Region	Ultrasound Exams	X-Ray Exams	Special Diagnostic Imaging Procedures
RQRHA	3	2	
Saskatoon	27	50	3
Prince Albert Parkland	217	71	2
Kelsey Trail	1		
Out of Province	3	5	
Total	251	128	5

2.4.2.2 - Fee for Service DI in the Cypress Health Region

Situated in the southwest corner of Saskatchewan, physicians in the Cypress health region perform some MSB funded ultrasound services. CHRA reports that there are also a number of special procedures performed in the regional hospital. These are image-guided procedures, mostly breast investigations. These procedures are paid on a fee-for-service basis and are shown in this section, as they are additional to those reported by the Cypress Regional Heath Authority. There are also a small number of pelvic ultrasounds performed in this region and funded by MSB.

Table 20 - Total DI Services in Cypress Region

Funding Source	MSB			RHA	TOTAL
	Ultrasound	General Radiology*	Special Procedures	All Diagnostic Imaging**	MSB and RHA
# services	361		147	35,551	36,059
# discrete patients	349		142	N/A	N/A

* includes diagnostic mammography
** for breakdown, see Table 4 or Appendix 4

Even though some services are available locally, residents of this region may need to travel to other areas for some of their DI tests. Also, residents may receive DI examinations or procedures in this region that are interpreted and billed by physicians elsewhere. In this case, services would be reported in those other regions.

The table below shows where residents of this region receive fee-for-service DI services. As the Cypress health region borders Alberta it is not surprising to learn from the CHRA that a number of patients receive these services from Alberta.

Table 21 - DI Services Provided to Residents of the Cypress Health Region

Provider Health Region	Ultrasound Exams	X-Ray Exams	Special Diagnostic Imaging Procedures
Five Hills	7	13	
Cypress	326		136
RQRHA	110	248	163
Sunrise	3		
Saskatoon	378	530	189
Kelsey Trail	1		
Prince Albert Parkland	3	5	
Prairie North	2		
Out of Province	1,157	1,456	
Total	**1,987**	**2,252**	**488**

2.4.2.3 Fee for Service DI in the Five Hills Health Region

Residents of Five Hills region have access to ultrasound and X-ray services insured by MSB; they are provided in several facilities in Moose Jaw. The table below shows the total number of DI services funded both publicly and by MSB.

Table 22 - Total DI Services in Five Hills Region

Funding Source	MSB			RHA	TOTAL
	Ultrasound	General Radiology*	Special Procedures	All Diagnostic Imaging**	MSB and RHA
# services	596	5,091		52,189	57,876
# discrete patients	591	3,098		N/A	N/A

* includes diagnostic mammography
** for breakdown, see Table 4 or Appendix 4

Even though DI services are provided in private clinics in Moose Jaw, in order to meet their health care needs, many residents of this region travel to more urban areas for DI services, especially ultrasound examinations. Also, residents may receive DI procedures in their region, but the tests could be sent to other regions for physicians to interpret and bill. These services would be reported in those other regions. Table 23 shows the regions that provide fee-for-service DI services to residents of the Five Hills Health Region. The distribution of ultrasound procedures outside of the health area is expected to change as a result of the establishment of a new ultrasound clinic in Moose Jaw this past summer.

Table 23 - DI Services Provided to Residents of the Five Hills Health Region

Provider Health Region	Ultrasound Exams	X-Ray Exams	Special DI Procedures
Five Hills	561	4,701	
Cypress	12		3
RQRHA	1,089	1,545	522
Sunrise	3		
Saskatoon	264	638	138
Prince Albert Parkland	6	21	
Out of Province	114	261	
Total	**2,049**	**7,166**	**663**

2.4.2.4 Fee for Service DI in the Heartland Health Region

There are no MSB insured DI services in the Heartland Health Region. Most residents travel to the Saskatoon health region to access FFS DI services, though a few travel elsewhere.

Table 24 shows the regions that provide fee-for-service DI services to residents of the Heartland Health Region.

Table 24 - DI Services Provided to Residents of the Heartland Health Region

Provider Health Region	Ultrasound Exams	X-Ray Exams	Special Diagnostic Imaging Procedures
Five Hills	5	7	
Cypress	17		
RQRHA	38	88	
Saskatoon	6,078	6,481	
Kelsey Trail	4		
Prince Albert Parkland	15	23	
Prairie North	78		
Out of Province	169	476	
Total	**6,404**	**7,075**	

2.4.2.5 Fee for Service DI in the Keewatin Yatthe Health Region

Again, residents of this region have no fee-for-service DI services and must travel to other regions. The primary recipients for these patients are clinics in Saskatoon and Prairie North health regions, as they are the closest urban centers to this northern health region.

The table below shows the regions that provide fee-for-service DI services to residents of the Keewatin Yatthe Health Region.

Table 25 - DI Services Provided to Residents of the Keewatin Yatthe Health Region

Provider Health Region	Ultrasound Exams	X-Ray Exams	Special Diagnostic Imaging Procedures
RQRHA		5	
Saskatoon	603	496	115
Prince Albert Parkland	53	104	1
Sunrise	3		
Prairie North	876		
Out of Province	9	21	
Total	**1,544**	**626**	**116**

2.4.2.6 Kelsey Trail Health Region

Residents of this region are able to access MSB insured DI ultrasound services in the region. One source of these services is the sole radiologist in this region, who owns ultrasound equipment at the DI facility in Nipawin and receives payment through MSB for tests he performs there. The region pays the technologist through the radiologist. This appears to be a valuable service as most patients in this region are able to stay within their region for ultrasound tests.

Table 26 - Total DI Services in the Kelsey Trail Health Region

Funding Source	MSB			RHA	TOTAL
	Ultrasound	General Radiology *	Special Procedures	All Diagnostic Imaging**	MSB and RHA
# services	2,659		1	35,489	38,149
# discrete patients	1,819		1	N/A	N/A

* includes diagnostic mammography
** for breakdown, see Table 4 or Appendix 4

Again, residents of Kelsey Trail health region may travel far and wide for their DI examinations, primarily to more urban centres. (Note: it is possible that residents receive some procedures in this region but the tests are interpreted and billed by physicians elsewhere. These services would therefore be reported in those other regions).

Table 27 shows the regions that provide fee-for-service DI services to residents of the Kelsey Trail Health Region.

Table 27- DI Services Provided to Residents of the Kelsey Trail Health Region

Receiving Health Region	Ultrasound Exams	X-Ray Exams	Special Diagnostic Imaging Procedures
Five Hills	1	7	
Cypress	1		
RQRHA	64	133	11
Sunrise	51		
Saskatoon	1,730	1,778	679
Kelsey Trail	2,558		1
Prince Albert Parkland	349	552	15

Prairie North	7		
Out of Province	47	196	
Total	**4,808**	**2,666**	**706**

2.4.2.7 Fee for Service DI in Mamawetan Churchill River HA

There are no FFS clinics in the three most northerly health regions, Mamawetan Churchill River region, Keewatin Yatthe and Athabasca, so residents must travel to other locations for MSB funded services. A huge number (1,159) of X-Ray examinations are performed in Manitoba to support residents of MCRRHA. This migration pattern is not surprising as this health region borders nearly half of Manitoba's western border. Most ultrasounds are performed in Saskatoon and Prince Albert's private community clinics.

The table below shows the regions that provide fee-for-service DI services to residents of the Mamawetan Churchill River Health Region.

Table 28 - DI Services Provided to Residents of the Mamawetan Churchill River Health Region

Provider Health Region	Ultrasound Exams	X-Ray Exams	Special Diagnostic Imaging Procedures
Five Hills		5	
RQRHA	8	24	1
Saskatoon	289	409	164
Prince Albert Parkland	680		5
Kelsey Trail	6	755	
Prairie North	8		
Out of Province	9	1,194	
Total	**1,000**	**2,387**	**170**

2.4.2.8 Fee for Service DI in the Prince Albert Parkland HA

The city of Prince Albert has several FFS clinics offering ultrasound and X-Ray services, including mammography. A small number of image-guided special procedures are also performed and reimbursed by MSB.

Table 29 - Total DI Services in the Prince Albert Parkland Health Region

Funding Source	MSB			RHA	TOTAL
	Ultrasound	General Radiology*	Special Procedures	All Diagnostic Imaging**	MSB and RHA
# services	10,100	19,860	100	38,842	68,802
# discrete patients	7,355	11,379	89	N/A	N/A

* includes diagnostic mammography
** for breakdown, see Table 4 or Appendix 4

Residents of this health region have most of their FFS work done locally, but some may travel elsewhere, primarily to the more urban Saskatoon region. It is possible that residents receive procedures in this region but the tests are then sent to physicians in other regions for interpretation and billing. These tests would be reported in the other regions.

Table 30 shows the regions that provide fee-for-service DI services to residents of the Prince Albert Parkland Health Region.

Table 30 - DI Services Provided to Residents of the Prince Albert Parkland Health Region

Provider Health Region	Ultrasound Exams	X-Ray Exams	Special Diagnostic Imaging Procedures
Five Hills		12	
Cypress	1		
RQRHA	45	85	9
Sunrise	4		
Saskatoon	1,647	3,294	1,078
Kelsey Trail	28		
Prince Albert Parkland	7,681	17,380	74
Prairie North	61		
Out of Province	94	371	
Total	**9,551**	**21,142**	**1,161**

2.4.2.9 Fee for Service DI in the Prairie North Health Region

Residents of Prairie North have several sources of ultrasound services available in the community. Ultrasound is available through several gynecologists' offices and there are two general practitioners in Meadow Lake who have privileges to perform ultrasound in Meadow Lake.

Table 31 - Total DI Services in the Prairie North Health Region

Funding Source	MSB			RHA	TOTAL
	Ultrasound	General Radiology*	Special Procedures	All Diagnostic Imaging**	MSB and RHA
# services	3,947			59,258	63,205
# discrete patients	2,237			N/A	N/A

* includes diagnostic mammography
** for breakdown, see Table 4 or Appendix 4

In order to meet their entire DI needs, residents of this region must sometimes travel to FFS community clinics in other regions. Also, residents could receive DI examinations in their region, but the tests could be sent to physicians in other regions for interpretation and billing. In these cases, the services would be reported in the other regions.

The table below shows the regions that provide fee-for-service DI services to residents of the Prairie North Health Region. A significant number of ultrasound services are provided in the Saskatoon region and a large number (4,828) of X-Ray services are provided by the Province of Alberta.

Table 32 - DI Services Provided to Residents of the Prairie North Health Region

Receiving Health Region	Ultrasound Exams	X-Ray Exams	Special Diagnostic Imaging Procedures
Five Hills		11	
RQRHA	38	53	10
Sunrise	3		

Saskatoon	1,936	2,293	708
Prince Albert Parkland	338	108	
Prairie North	2,384		
Out of Province	763	4,921	
Total	**5,462**	**7,386**	**718**

2.4.2.10 Fee for Service DI in the Regina Qu'Appelle HA

Along with Saskatoon, this health region offers the most integrated care in the province. There are numerous clinics offering ultrasound, X-Rays and special DI procedures on a fee-for-service basis.

Radiologists also perform all types of special DI procedures in the region's provincial hospitals. These include: angiography, angioplasty, image guided procedures, and invasive procedures.

MSB paid for 4,143 special DI procedures to be done in this health region in 2003-2004. The hospitals report having performed 7,609 such procedures. We know that some of these were performed in FFS clinics; however, as we also know that there is no one-to-one relationship between the MSB and hospital counts, it is not possible to deduce how many were performed privately. All one can state is that by far, the largest number was performed in the hospitals. Angiography and angioplasty are performed in hospitals only. Radiologists in FFS clinics performed some image guided procedures and possibly, a small number of invasive procedures.

Table 33 - Total DI Services in the Regina Qu'Appelle Health Region

Funding Source	**MSB**			**RHA**	**TOTAL**
	Ultrasound	**General Radiology***	**Special Procedures**	**All Diagnostic Imaging****	**MSB and RHA**
# services	42,398	94,477	6,057	219,142	362,344
# discrete patients	24,381	51,708	3,004	N/A	N/A
Billings (MSB)/ RHA Physician Compensation ($)	3,064,814	3,554,439	528,607	9,321,210	16,469,070
Operating Budget ($)	N/A	N/A	N/A	11,364,882	11,364,882
DI Total Costs				**20,686,092**	**27,833,952**

* includes diagnostic mammography
** for breakdown, see Table 4 or Appendix 4

Even with some of the most comprehensive health care services in the Province, a small proportion of residents of this region travel to other regions for community based DI tests. Residents may receive DI examinations in their region but the tests could be sent to physician elsewhere for interpretation and billing. These services would be reported in the other regions. The table below shows the regions that provide fee-for-service DI services to residents of the Regina Qu'Appelle Health Region.

Table 34 - DI Services Provided to Residents of the Regina Qu'Appelle Health Region

Receiving Health Region	Ultrasound Exams	X-Ray Exams	Special Diagnostic Imaging Procedures
Five Hills	9	114	
Cypress	2		
RQRHA	32,945	84,800	3,951
Sunrise	499	4	
Saskatoon	568	985	191
Kelsey Trail	15		
Prince Albert Parkland	40	88	1
Prairie North	19		
Out of Province	430	1,100	
Total	**34,527**	**87,091**	**4,143**

2.4.2.11 Saskatoon Health Region

This is the health region with the largest population and the largest number of medical imaging clinics providing services insured by MSB. Ultrasound, X-Ray and special DI procedures are offered by approximately twenty FFS radiology enterprises in the Greater Saskatoon area.

FFS ultrasound and X-Ray services may be combined with those provided in publicly funded facilities to produce a total volume for the region but special DI procedures are not as easily calculated. The same situation exists here as does in the Regina Qu'Appelle region; the costs may be added to produce a total for the region but a specific breakdown into public and FFS work is not possible.

In 2003-2004 MSB paid a total of $864,463 for 9,894 special DI procedures to be performed in the Saskatoon region. The region's tertiary hospitals reported 5,731 vascular procedures and 1,799 interventional procedures during the same period. We know that angioplasties and angiographies are limited to hospitals. We know that in Saskatoon, no mammography work is performed in hospitals but that the community clinics do all such work, including image guided procedures. With respect to the number of image guided and invasive procedures performed privately, we can simply deduce that it represents a significant proportion of the total work done in this region, probably a larger proportion than for Regina.

Table 35 - Total DI Services in the Saskatoon Health Region

Funding Source	MSB			RHA	TOTAL
	Ultrasound	General Radiology*	Special Procedures	All Diagnostic Imaging**	MSB and RHA
# services	61,991	142,082	9,894	259,091	473,058
# discrete patients	41,419	74,648	4,020	N/A	N/A
Physician Compensation ($)	4,353,962	5,730,230	864,463	8,641,839	19,590,494

Operating Budget ($)	N/A	N/A	N/A	13,255,353	13,255,353
DI Total Costs				**21,897,192**	**32,845,847**

* includes diagnostic mammography
** for breakdown, see Table 4 or Appendix 4

Saskatoon Health Region residents may have some of the best DI services in the Province, but a few residents still travel to surrounding areas for their tests. In some cases, residents may receive procedures in their region, but the tests are interpreted and billed by physicians elsewhere. These services would be reported in the other regions.

Table 36 shows the regions that provide fee-for-service DI services to residents of the Saskatoon Health Region

Table 36 - DI Services Provided to Residents of the Saskatoon Health Region

Provider Health Region	Ultrasound Exams	X-Ray Exams	Special Diagnostic Imaging Procedures
Five Hills		41	
Cypress			2
RQRHA	673	994	85
Sunrise	94		
Saskatoon	47,044	122,192	5,290
Kelsey Trail	23		
Prince Albert Parkland	261	560	2
Prairie North	57		
Out of Province	384	1103	4
Total	**48,536**	**124,900**	**5,383**

2.4.2.12 Fee for Service DI in the Sun Country Health Region

There are no physicians who bill for insured services in the Sun Country region. Residents of this region travel to other areas for these services, by far the largest component migrating to the Regina Qu'Appelle health region. (It is possible that in some cases residents receive examinations in this region but the tests are interpreted and billed by physicians elsewhere. These services would be reported in the other regions.)

The table below shows the regions that provide fee-for-service DI services to residents of the Sun Country Health Region.

Table 37 - DI Services Provided to Residents of the Sun Country Health Region

Provider Health Region	Ultrasound Exams	X-Ray Exams	Special DI procedures
Five Hills	11	34	
Cypress	1		
RQRHA	6,233	4,047	696
Sunrise	60		
Saskatoon	109	283	16
Kelsey Trail	1		
Prince Albert Parkland	4	13	

Prairie North	2		
Out of Province	88	516	
Total	**6,509**	**4,893**	**712**

2.4.2.13 Fee for Service DI in the Sunrise Health Region

Located east of the Saskatoon and Regina Qu'Appelle regions, the residents of Sunrise Health Region are able to access fee-for-service ultrasound services in their own region. There are no other MSB funded services available here. Some of these services are provided by two obstetrics/gynecology offices located in Yorkton.

Table 38 - Total DI Services in the Sunrise Health Region

Funding Source	**MSB**			**RHA**	**TOTAL**
	Ultrasound	General Radiology *	Special Procedures	All Diagnostic Imaging**	MSB and RHA
# services	6,502	4		60,951	67,457
# discrete patients	3,763	3		N/A	N/A

* includes diagnostic mammography
** for breakdown, see Table 4 or Appendix 4

The residents of Sunrise region may travel to other regions for FFS DI tests, as well as to other provinces. They could also receive some DI procedures within their region, but the tests could interpreted and billed by physicians elsewhere. In these cases, the services would be reported in the other regions.

The table below shows the regions that provide fee-for-service DI services to residents of the Sunrise Health Region It is not surprising that the two closest urban regions, Saskatoon and Regina, supply most of these services.

Table 39 - DI Services Provided to Residents of the Sunrise Health Region

Provider Health Region	**Ultrasound Exams**	**X-Ray Exams**	**Special Diagnostic Imaging Procedures**
Five Hills		17	
Cypress	1		
RQRHA	697	1,514	562
Sunrise	5,063		
Saskatoon	569	1,145	306
Kelsey Trail	7		
Prince Albert Parkland	9	12	
Out of Province	71	438	
Total	**6,417**	**3,126**	**868**

2.4.3 ECHOCARDIOLOGY

In 2003/04, over $3 million was spent on the provision of echocardiology services paid on a fee-for-service basis. These services are not available in very rural regions. They exist in the same health regions that have other FFS DI services.

The table below shows the echocardiology examinations that were performed in FFS facilities in 2003/04.

Table 40 – Fee for Service Echocardiology (2003/04)

	# Services	# Discrete Patients	$ Billed
Provider Health Region			
Athabasca	0	0	0
Cypress	607	598	54,270
Five Hills	5,942	2,785	480,843
Heartland	0	0	0
Keewatin Yatthe	0	0	0
Kelsey Trail	911	450	69,000
Mamawetan Churchill River	0	0	0
Prairie North	112	56	2,831
Prince Albert Parkland	838	806	74,521
RQRHA	16,044	9,370	1,288,576
Saskatoon	17,176	10,866	1,331,434
Sun Country	0	0	0
Sunrise	1,186	645	90,188
Total	**42,816**		**3,397,257**

As expected, Cardiologists, both adult and pediatrics, performed the highest number of echocardiograms; followed by Internal Medicine physicians, GPs, and Anaesthetists performing intra-operative transesophageal echocardiograms.

Table 41 - Echocardiograms by Specialty (Community Services)

Specialty	# Services	# Discrete Patients	Total Billings ($)
General Practice	263	125	18,728
CB- Pediatrics	1	1	90
Pediatric Cardiology	2,040	1,552	180,026
Internal Medicine	15,338	9,185	1,138,374
Cardiology	24,816	14,900	2,021,556
Anaesthesia	357	353	38,450
Orthopedic Surgery	1	1	35
Total	**42,816**	**N/A**	**3,397,257**

* Workload and costs are incremental to that shown elsewhere in the report.

2.4.4 NUCLEAR MEDICINE

There are two health regions within Saskatchewan that operate two Nuclear Medicine departments, that is one each, at three sites. One site is located in Saskatoon and the other two are in Regina, all of which operate in isolation from the DI Departments. In the long term this may prove to be disadvantageous as there is both a convergence of functional imaging (fMRI does many of the things. e.g., mapping relative cerebral blood flow patterns) traditionally seen as the province of nuclear medicine while the technical convergence implicit in combined PET/CT imaging will require harmonization of skills. Not least the duplication of administrative services may be less than optimal fiscally.

Saskatoon

The Department at Royal University Hospital operates six gamma cameras of varying ages from 5 years to 22 years old. Because of age dependant changes in the crystal gamma cameras perform poorly when not upgraded at about ten-year intervals. There are two bone density-measuring units, one thyroid uptake probe, and one gamma and one beta counter.

Statistics related to the Nuclear Medicine Department at Royal University Hospital:

- Annual budget is in Table 3 includes staffing, supplies, service contracts and physician compensation
- Hours of operation 0700-1630 Monday to Friday with on call service after regular hours and on weekends
- Staffing consists of 12 FTE's, age range 20's – 50's
- Two physicians provide clinical coverage to the department
- Referrals are 70% from within the region and 30% from out of region.

The daily workload amounts to 105 cases and the yearly total is 24,000 examinations including bone density tests.

Waitlist are regularly monitored and the following are the results as of July 2004:

- Bone Density 8353 requisitions are waiting to be booked (16.75 months)
- MIBI 924 requisitions are waiting to be booked (44.5 weeks)
- Hepatobiliary 26 requisitions are waiting to be booked (26.0 weeks)
- Renal 0 requisition (9.25 weeks)
- Whole Body Bone Scan (routine) 0 requisition (6.50 weeks)
- Whole Body Tumour Scan 0 requisition (3.50 weeks)
- Other Cancer investigations 0 requisition (5.00 weeks)

The department is now measuring the time between receiving a requisition and the date the patient will be scheduled.

Although staff are recruited from within their own training program the department experiences higher than normal staff turnover. Losing staff to other provinces and experiencing increased sick time puts a greater demand on existing staff. Recruiting and retaining staff is seen as a serious issue.

On going educational programs are provided through Canadian Association of Medical Radiation Technologists (CAMRT), the Society of Nuclear Medicine, and the General Electric (GE) Medical Satellite.

Regina

The Regina Qu'Appelle Health Region manages one nuclear medicine department at two sites, one at the Regina General Hospital and one at the Pasqua Hospital. The equipment consists of 8 Gamma Cameras and one bone density unit.

Statistics related to the Nuclear Medicine Departments at both sites:

- Annual budget in Table 3 includes staffing, supplies, and physicians' remuneration, (service contract are covered under Bio-Medical Services).
- Hours of operation 0800-1600 hrs Monday to Friday with on call services Monday to Friday 1600-0100hrs, Saturday, Sunday and vacation-day standby is provided 24 hours.
- Staffing consists of 27.27 FTE's (25.88 FTE's in 2002/2003) this includes bone density, age range 20's – 50's
- Two physicians rotate between both sites
- Referrals are 60% from within the region and 40% external to region

The department does an average of 25 patients (not examination) and the yearly total is 13,053 patients including bone density tests (4,279).

Waitlists vary. Cancer patients may wait 2 weeks while bone density patients wait for over a year.

One of the major concerns is the staff shortage. There are currently four technologist positions vacant. It is difficult to recruit and retain staff. Most technologists leave the province as wages are lower than in neighbouring provinces and there is a persistent lack of capital resources.

An in-house training program started in 2001 to address the technologists' shortfall. The province also attaches bursaries to training programs as an incentive.

The region offers in-house and vendor continuing education and selective participation for staff at external courses and seminars. There have been recent cuts to the educational budget, however the fulltime position of the NMT clinical instructor has been maintained.

2.4.5 SASKATCHEWAN CANCER AGENCY

The Saskatchewan Cancer Agency (SCA) provides cancer treatment services at its two cancer clinics – the Saskatoon Cancer Centre (SCC) in Saskatoon and the Allan Blair Cancer Centre (ABCC) in Regina. Saskatchewan Health funds these two centres to provide chemotherapy and radiation therapy services for cancer patients. Diagnosed cancer cases are increasing by about 2.5 per cent per year. Once patients are diagnosed they are registered with the SCA and, in most cases, seen by a cancer clinic oncologist to plan the treatment. Surgery, chemotherapy and radiation therapy are the most common treatment methods.

DI plays an important role in diagnosis, during the staging process, and during the treatment phase, to monitor changes. All imaging modalities are involved. Table 42 shows patient volumes by DI modality and SCA facility.

Table 42 - DI Services Provided for SCA for 2003/04

Modality	SCC** # of exams	SCC Cost ($)	ABCC # of exams	ABCC Cost ($)*	Total # of exams	Total Cost ($)
General Radiology	5,450	278,863	3,274	262,663	8,724	
CT Scans	3,523	418,883	6,228	769,445	9,751	
Vascular/Interventional	604	198,224	147		751	
Ultrasound	423	44,968	886		1,309	
MRI	364	130,763	37		401	
Nuclear Medicine	1491	257,555			1491	
Bone Density	94	2,996			94	
Total	**11,949**	**1,332,252**	**10,572**	**1,032,108**	**22,521**	**2,364,360*** **

* Note: a further breakdown was not available. Included in RHA totals.
** Reimbursement is $155,188.
*** Reimbursement of diagnostic imaging procedures is reportedly not standardized nor consistently applied across the province.

It should be noted that workload identified above is not incremental to that shown elsewhere within the report.

2.4.6 WORKERS' COMPENSATION

The Workers' Compensation Board (WCB), in existence for over 70 years, is an independent body created by provincial legislation under the Workers' Compensation Act. Its mandate is to protect workers and employers against the results of work injuries. The focus therefore lies in promoting injury prevention to employers and workers through educational sessions and workshops. In case of an injury, WCB will assess and assist employees in a return-to-work program. The WCB in Saskatchewan, with its head office in Regina, is funded through annual premiums paid by employers and is accountable to its stakeholders: employers, workers, caregivers, and the public.

WCB is one of the clients of the Saskatchewan health care system, including DI services. WCB tracks all reported injuries; their website (www.wcbsask.com/) provides a number of statistics. For the purpose of this report, only statistics related to repetitive injuries amongst DI personnel* are displayed.

Table 43 - Repetitive Strain Injuries Reported Through Saskatchewan WCB, 2001 to 2003 or 2004

Claim Type	Year	# of Claims	Average Compensation Days Paid	Total Loss ($)
Claimant had no time loss	2001	3	0	521
	2002	4	0	619
	2003	4	0	938
	2004*	1	0	558
No Time Loss Total		**12**		****2,637**
Claimant had time loss from work	2001	2	55	18,190
	2002	3	4.3	2,000
	2003	5	46	32,729
Time Loss Total		**10**	**105.3**	**52,919**
Grand Total		**22**		**55,546**

* Not able to obtain statistics by occupation; these numbers include laboratory technologists and respiratory technologists. Claims may be registered under a number of diagnoses so incidence may be higher than recorded.
** Figures may not add exactly, due to rounding error.

WCB Diagnostic Needs

MRI Imaging

Recently, DI departments in Saskatoon and Regina entered into agreements with the WCB to provide "expedited MRI" examinations on a regular basis during extended hours of operation ("extended" includes time outside of regular operating hours, as posted from time-to-time by a facility). One of the agreements went into effect in January 2003, and the second in September 2004. Prior to these "Special Arrangement MRIs" with the Regina and Saskatoon RHAs, the WCB had contracts with Mayfair Diagnostics in Calgary, Medical Imaging Consultants in Edmonton, and Trinity Hospital in Minot, North Dakota, USA. WCB's goal is to reduce 'out of province' referrals by increasing the services it purchases within the province. All MRI appointments are arranged by WCB on behalf of the referring physician.

Table 44 - MRI Volumes for WCB Patients, 1999-2003

Year	Elective In-Province* MRIs	Special Arrangement MRIs** in SK	Out of Province MRIs*** (AB+BC+USA)	Total
1999	61		N/A	61
2000	229		400+2+1	642
2001	234		609+2+7	904
2002	222		662+0+3	1028
2003	145	32	708	976

* "Elective in-province" refers to the numbers of MRIs booked in SK by specialists, directly, on an elective basis
** "Special Arrangement MRIs" refers to the new agreements between Saskatchewan WCB and the Regina and Saskatoon RHAs
*** "Out-of-province" refers to MRI appointments expedited by WCB using out-of-province or out-of-country clinics

Table 45: Cost of MRI Examinations as Reported (all in $)

Year	Elective In-Province MRIs	Special Arrangement MRIs in SK	Out of Province MRIs (AB+BC+USA)	Total
1999	39,835			39,835
2000	149,425		322,957	472,382
2001	155,120		532,737	687,857
2002	148,829		353,187	502,016
2003	94,975	37,440	371,914	504,329

WCB pays $1170 per scan to the Regina and Saskatoon RHAs, twice the actual cost of an examination, thus funding an MRI for a WCB client as well as one for a public patient. This cost was arrived at by combining service cost fees and travel costs for out-of-province MRIs. In addition, WCB pays a premium of $10,000 per year to each of the two RHAs, for a minimal service level of 100 MRI imaging scans per year per facility. Currently the two RHAs are unable to handle the full WCB volume due to staff shortages at the Regina General Hospital and the inability of the Saskatoon RHA to provide enhanced imaging.

The future will see a shift towards higher numbers in the "Special arrangement MRIs" category and a drop in the "Out of Province MRIs" category. The benefit however, is not only to the province but also to the client who may not need to travel as far.

CT Imaging

WCB purchases CT services within the province at a rate of $200 per scan. Where wait time become too lengthy, CTs are performed for WCB out of province. The CT services purchased by WCB are performed outside the hours reserved for the general population.

CT scan data for scans performed in 2003 and 2004 are shown in Table 46 below. For 2003, the data are based on invoices paid to October 13, 2004. WCB is only able to count CT scans for which they have received invoices; unpaid scans cannot be counted.

Table 46: CT Scans Performed for WCB, 2003 and 2004

Year	In-Province			Out-of-province		
	Elective	Expedited	Cost ($)	Elective	Expedited	Cost ($)
2003*	212	34	49,200	5	13	6,360
2004	47	34	24,000	Unknown**	24	5,200

* Reflects invoices paid by WCB up to Oct 13, 2004.
** Unknown as all services have not been paid for.

The system should strive for minimal waitlists and improved access, so all patients in the province have equal access to the required diagnostic imaging facilities.

* It should be noted that workload identified in this WCB section for in-province services is not incremental, while out-of-province would be incremental. .

2.4.7 CARDIAC CATHETERIZATION LABORATORIES

Saskatchewan has two cardiac catheterization laboratories, one in Regina at the Regina General Hospital and one in Saskatoon at the Royal University Hospital. Both RHAs support the study, diagnosis, and treatment of a wide range of cardiac and related conditions through their cardio-sciences programs and services. As of fiscal year 2005-2006, funding has been provided to operate a cardiac electro-physiology program at the Regina General Hospital. Both sites offer ongoing education for cardio vascular technicians either in-house, through the vender, or through the British Columbia Institute of Technology.

Regina General Hospital

The Regina General Hospital operates a new, single plane, cardiac catheterization laboratory, along with an existing bi-plane cardiac catheterization laboratory (slated for replacement 2004-2005). Facts about the Regina Cardiac Catheterization Laboratory:

- Annual budget is $4.6 million, including staffing, supplies, and service contracts.
- Hours of operation are Monday to Friday from 0700-1630 hours with on-call services after hours and on weekends.
- Six cardiologists with catheterization lab privileges (age range 40's-60's).
- Staffing during a procedure employs an imaging technologist and two cardiovascular staff.
- The current staffing complement includes 2.5 FTE medical radiation technologists (age range 40's-50's) and 3.5 FTE cardiovascular staff (age range 35-45 years).
- Average number of cases per day =10.
- Yearly number of procedures = 2,600, including interventional and diagnostic procedures and pacemakers (n=400).
- Referral pattern: 60% outside RQRHA, 40% within RQRHA.
- Staffing issues: staff turnover amongst the cardiovascular staff due to unresolved union issues, stress leave due to heavy workload, and staff migration to other provinces and to FFS industry. This situation may escalate as some members will be reaching retirement within the next two years. Recruitment and retention are serious concerns.
- The RQRHA is adding an electro-physiology program to their cardiac services. This involves additional staff, however numbers have not been decided.

Royal University Hospital (Saskatoon)

The Royal University Hospital (RUH) operates two cardiac catheterization laboratories: one has a 4-year old Phillips bi-plane unit and the other has a 16-year old bi-plane unit (functions as a single plane unit currently due to equipment problems). Management has presented a business case to the region for immediate unit replacement (2004-2005). Additions of new programs such as a permanent pacing program and a post-angioplasty unit will expand the cardiac catheterization laboratory services in the near future. Facts about the RUH Cardiac Catheterization Laboratory:

- Annual budget is $3.8 million, including staffing, supplies, and service contracts.
- Hours of operation are 0800 to1630 Monday to Friday with on-call services after hours and on weekends.
- 3.5 cardiologists with catheterization lab privileges (age range 30's - 70's).
- Staffing is comprised of 1 FTE registered nurse (RN), 1 FTE booking clerk, 1FTE porter, 1.6 FTE imaging technologists, and 7.5 cardiovascular staff (age range 40's - 50's).
- Staffing per procedure includes two cardiovascular technologists and one medical radiation technologist. There are reported concerns around patient safety and medical-legal risk to the staff and a need is seen to expand staffing to include nursing. Currently nursing staff (one nurse) is involved at the triage level.
- Average cases per day = 7-12, (Lab #1 = 7/day; Lab #2 = 5/day, 3 days/ week).
- Procedures/year = 2,536, including 68 pacemaker insertions.
- Being a tertiary center with specialized services, the center experiences a high number of referrals: northern Saskatchewan = 94.25%, southern Saskatchewan = 4.52%, out-of-province = 1.1 %, and USA = 0.13%.
- Staffing is stable. There have been no grievances and no occupational health and safety issues.

* It should be noted that workload identified is incremental to that shown elsewhere within the report.

2.4.8 SCREENING MAMMOGRAPHY PROGRAM

The Saskatchewan Screening Mammography Program (SMP), founded in 1990, is funded by Saskatchewan Health through the "Prevention and Early Detection" division of the SCA. It is a province-wide program with a mandate to decrease mortality from breast cancer for women in Saskatchewan. Women book their own appointments every two years at locations convenient for them. The program provides full-time services at its centres in Regina and Saskatoon and at its part-time centres in North Battleford, Swift Current, Yorkton, Moose Jaw, and Prince Albert. All other parts of the province are serviced by a mobile service, which covers its territory over a two-year period. All mammography screening in the province is done through the SMP. Screening mammography done in RHAs on behalf of the SMP is incremental to RHA workload.

All films are interpreted by radiologists in Regina and Saskatoon. The SMP is accredited through the Mammography Accreditation Program of the Canadian Association of Radiologists. SMP data are displayed in Table 47.

Table 47: SMP Data: Examinations and Staffing by Site, Totals for 2001-2004

Location	# of Exams*	# of FTE's	
	01/02 - 03/04	Administration	MRT
Regina	27,370	9.17	3.0
Saskatoon	21,017	3.67	2.4
Swift Current	4,280	.03	.5
Prince Albert	7,351	.07	.5
Moose Jaw	5,525	.05	.4
North Battleford	4,674	.04	.5
Yorkton	8,120	.07	.4
Mobile screening van	28,091	4.32	3.0
Total	**106,428***	**17.42**	**10.7**

* Total workload 2001-2004

The annual budget for the SMP is $2,460,516 (03/04). The cost per exam is $60.00 and radiologist reimbursement is $10.40 per screening exam. Compensation for the Regina radiologist group comes from the SCA, administered through the RQHR. The Saskatoon radiologist group is reimbursed directly by the SCA.

2.4.9 ACADEMIC RADIOLOGY

Current State

In Saskatchewan, there is a fully accredited residency programme in radiology, predominantly centered at the RUH in Saskatoon, with rotations to the other Saskatoon and Regina imaging facilities. There is a broad consensus in support of the programme among provincial radiologists although there is anecdotal evidence that radiology residents may have been adversely influenced by the lack of cooperation and constructive interaction among the various radiology practices in Saskatoon. In addition, in the past, the status of programme accreditation by the Royal College of Physicians and Surgeons of Canada has come under question due to low RUH faculty numbers.

Overview

Historically, the radiological sciences (or DI) have had little impact on faculties of medicine as radiologists have been seen as predominantly service-oriented rather than academic. With recent changes in the scope of radiology that is now changing.

- Sectional imaging is now seen as vital to the teaching not only of radiology but also anatomy. Indeed in some universities “anatomy” as a discipline has ceased to exist outside of radiological expertise in anatomy.
- Modern tools in imaging not only contribute to diagnosis but, in the case of functional MRI, PET, molecular imaging, optical imaging, and magneto-encephalography, have the capacity to lead to the fundamental understanding of disease processes.
- Interventional radiology is attracting some of the best and brightest medical students who see the advantages to minimally-invasive techniques as having the potential to fundamentally change the practice of medicine.
- The revolution in medical practice spurred on by molecular biology, nanotechnology, and genomics will require advanced imaging techniques to monitor and deliver treatment.

For these reasons, neither faculty of medicine nor health care administrations can afford in future to regard the radiological sciences as peripheral to either academic mission or delivery of advanced care. Radiological services must not only be adequately equipped for this future but staff and machines must have protected time to develop and capitalize on this advances possible through this technology. Increasingly, the successful university recruitment of talented individuals in research fields will be limited without an appropriate imaging infrastructure. For example, in Saskatoon there is a specific opportunity afforded by the development of high intensity light sources capable of the optical imaging of molecular processes.

No strategic view of the radiological sciences in Saskatchewan can ignore the rich history of the province in the application of physical energies to the care of people, or the immense opportunities afforded by new and future technologies to both understand and treat disease. However, these aspirations will suffer in the fragmented and unsatisfactory environment now in place.

Unfortunately, the persistent reductions in funding for DI academic activities have resulted in a shift in the mandate of radiology departments toward clinical service rather than new and exciting opportunities. The overwhelming clinical workload and the weight of ever-expanding wait lists, in association with a reduction in funding for academic pursuits, has led to a situation where radiologists feel compelled to minimize their involvement in teaching, research, and administrative activities. If radiologists are to be integrated into the academic and administrative fabric of the community, there must be a funding mechanism that recognizes the value of these pursuits.

At present, the predominant activity that generates revenue for radiology groups is performing, interpreting, and reporting clinical imaging procedures. Time spent in teaching, research, and administration is predominantly performed at the discretion of the radiology group. Group members determine whether there are enough radiologists to spare for these activities, given an overwhelming clinical workload and if the need to ensure income-generating activities. How then is one to explore the fascinating realm of the Canadian Light Source (CLS), anatomy, engaging medical students, meeting with RHA and government officials, being involved in national specialty activities, etc., when these activities are seen as a financial liability to a group practice?

PACS will certainly have an impact upon the clinical productivity of the radiologists. However, more must be made of utilizing this technology and other technologies related to digital distance learning to enhance the teaching and learning opportunities in the province. The sole focus cannot be clinical service.

The future of imaging looks very bright. Opportunities abound for radiologists to be involved in teaching, research, administration, and clinical service. However, the infrastructure, and the business structure, of the specialty in Saskatchewan must adapt to allow for diversity: diversity that reaches beyond the clinical milieu and allows for fuller engagement in the medical community. To fail to do so will open the door for other physicians and scientists to assume these roles, e.g., if radiologists are not involved in cardiac CT and MR imaging from the research, teaching, and clinical care perspective, it may soon fall under the umbrella of cardiology. Radiologists must enhance their capacity to diversify, train, and retrain and to adapt to the rapid, yet exciting, developments they are sure to experience in the future.

2.5 RADIOLOGICAL APPROPRIATENESS

Introduction

It has been estimated that 30% or even 50% of all medical procedures are carried out without their use being founded on sound evidence.[1,2] It has also been alleged that a number of radiological examinations are unnecessary.[3,4] These issues are of recurrent concern as redundant examinations contribute to marginal costs without marginal diagnostic gain and result in unnecessary radiation exposure for patients. The principal factors that contribute to unnecessary radiological examinations are:

- Fear by the referring physicians of litigation if procedures are not ordered
- Overwork on the part of referring physicians so that a "radiological diagnosis" becomes a speedy substitute for diagnosis through use of careful history-taking, a detailed physical examination and selective and appropriate use of investigations
- Over-reliance on technology in a technology-dominated world
- A desire on the part of referring physicians to be identified as technologically "savvy"
- Misguided standards of practice in a community, e.g., patients with headaches have skull X-rays despite lack of supporting evidence
- Ignorance about the limitations of a test or of its replacement by a more effective alternative (including lack of up-to-date knowledge leading to referrals for inappropriate investigations)
- Patients motivated by exposure to particular investigations through the web or the media and the referring doctor may be s loathe to upset their relationship with patients or to spend time educating them
- The egregious pursuit of "certainty"[5,xvi]
- Fiscal self-interest, either conscious or unconscious, resulting from recommendations of more testing on the part of the physician paid to interpret those tests.

During the research phase of this review, feedback was provided that supports the potential for inappropriate use of radiological services throughout Saskatchewan. These observations arose during discussions with user groups, interviews, focus groups and from feedback solicited by an online survey directed to specific groups.[xvii] DI providers perceive that physicians over-order for many reasons:

- Many physicians are new to practice in Saskatchewan and lack a well-developed knowledge base thus they augment with DI investigations
- Physicians fear litigation and order more tests than clinically indicated for protection

[xvi] Diagnosis is by its nature a statement of probability. Different physicians have different thresholds at which they will conclude that a diagnosis is sufficiently certain (probable) so as to provide a basis for action (or inaction when disease is excluded). Caution, that some might consider undue, may lead other physicians to continue investigations using tests that lead to the probability increasing asymptotically toward the elusive goal of certainty (probability = 1.0). The nature of this process is one where diagnostic yield becomes progressively smaller with each additional examination and the elusive probability is rarely reached.[5]

[xvii] Consumers (list of referring physicians provided by the College of Physicians and Surgeons); medical providers (radiologists and nuclear medicine physicians) working in the public (RHA), private (fee for service), and academic environments; all RHA CEOs; and all RHA diagnostic imaging managers and their staff.

- Physicians apply little clinical experience and rely too much on diagnostic tests, then re-order the same tests
- Physicians do not understand what modalities are for and order the wrong tests
- Recommendations for more tests from the physician paid to interpret them.

Appropriateness Issues

Measures such as the use of appropriateness criteria (AC) or practice guidelines are intended to address these issues, at least in part, with the goal of maximizing both clinical effectiveness and cost-effectiveness of radiology services.

Other measures with the potential for improvement include:

- Identification of the "gatekeeper" for the ordering of investigations
- Electronic implementation
- Measures to limit self-referral

These measures were discussed with radiologists and administrators to assess their acceptability within the Saskatchewan DI environment. The following observations are representative:

- Currently there are some evidence-based practice guidelines being used to guide practice; they are not used consistently and they have limited effectiveness.
- One area has developed a practice guideline and finds it helpful, but they recommend that province-wide guidelines are required and supported.
- Guidelines are not definitive rules and they still require that clinical judgment be used in their application, hence they can be applied inconsistently.
- There is acknowledgement that practice guidelines would reduce inappropriate utilization, especially in the area of plain film radiography.
- There is a belief that appropriateness guidelines for ultrasound would be very useful, but that they would need to be strictly monitored.
- Radiologists do not see themselves as the 'gatekeepers'.
- Referring physicians can be resourceful in getting around guidelines
- An audit would need to take place to determine if how consistently practice guidelines are applied.
- There is support for an electronic ordering system that would "flag" inappropriate referrals.
- Requisitions frequently do not provide enough patient information to support testing.
- There is support for physician education on appropriate DI testing.

Appropriateness Criteria (AC)

Language in this context can be confusing. For any radiological investigation, two a priori issues arise: should the test be done at all, and if so, how should it be done? The indications for a test are sometimes called guidelines but will here be called AC, as use of the terms guidelines and standards can be confusing. The term standards as used in this document refer to the minimum characteristics of an adequate examination.

AC should ideally be evidence-based, i.e., derived from prospective studies of representative populations, free of bias, and further validated in realistic settings. Good

AC should be explicit in stating the methods used to develop the criteria and the levels of evidence available. Rarely is the evidence adequate for this purpose. The alternative becomes the "Delphian approach" wherein a panel of experts considers such evidence as is available and then uses its collective wisdom and experience to recommend a diagnostic strategy. AC may be test-oriented or problem-oriented:

a) Test-oriented, e.g., in defining when it is appropriate to use magnetic resonance imaging of the brain.
b) Problem-oriented, e.g., in suggesting how to investigate a patient who presents with blood in his or her urine.

Certain radiological organizations have developed and published AC. In the USA, the American College of Radiology (ACR) has published guidelines that are procedure-based, both electronically and in print.[6] While these use evidence when it has been available, the evidence is often difficult to obtain, being published outside the regular electronic databases in the "fugitive" or "grey" literature. The Royal College of Radiologists in Great Britain has published guidelines that are problem-based.[7] These have subsequently been adopted by all countries of the European Union. They suffer from being less comprehensive than the ACR publications and apply the Pareto principle (80% of all work units) involve 20% of all procedures and these are the ones most optimally addressed. The Society of Francophone Radiologists in Quebec has subsequently published a similar document. Although not widely recognized the Royal Australian and New Zealand College of Radiology has published problem-based guidelines now in their fourth edition (a fifth is in preparation).[8] In many ways these are the most exemplary available and resulted from the same Federal and other governmental imperatives that we are experiencing in Canada.

In Canada, Dr. Ian Stiell (an Ottawa-based emergency room [ER] physician and health policy analyst) has developed a series of "rules" for the use of radiology in the ER for the investigation of ankle, cervical spine, and head injuries.[9-24] These have been developed based on evidence and have been validated in an exemplary way. The "Ottawa rules" seem to be in general use in Saskatchewan although such use is not audited.

The "gatekeeper"

Gatekeepers that have been suggested to control access to the system are both the referring physician and the radiologist. In general all physicians are reluctant to accept this role and Pellegrino has pointed out that doing so constitutes a conflict between ethical principles and economic self-interest.[25] A further difficulty is the sheer scale of knowledge that would be required to be an effective and well-informed gatekeeper suggesting the need for computer support.[26] Such considerations have prompted interest in electronic guideline implementation.[27] Blue Cross/Blue Shield in the USA has adopted a variety of third-party approaches to gate keeping by either publishing acceptable indications for a test it will reimburse and/or by retaining expert panels to sanction tests, particularly resource-intensive high-technology tests.

Electronic implementation

As indicated above, one way to avoid the issue of the scale of memorization required and the ethical dilemma posed by Pellegrino in implementing AC is to embed the criteria in the electronic order-entry process -- inappropriate requests are flagged and can be discussed by a radiologist and the ordering physician (or Quality Improvement

Committees). Indeed, in an increasing number of settings, physicians no longer "order tests" but simply refer patients for a consultation for problem solving. For example the patient is referred with "abdominal pain – please investigate" rather than for "barium meal". This anomalous historical problem was identified as such in a seminal editorial analysis "What's wrong with radiology" by Kassirer.

Self-referral (primarily an issue in the USA)

Self-referral is a contentious issue since attempts by radiologists in the USA to limit physicians who are non-radiologists referring patients for radiological examinations at facilities they themselves own and service have been interpreted as turf defence on the part of the radiologists. Nevertheless there is a large body of data to indicate that self-referral is associated with increased utilization.[27] Certainly, in a rational system some distance needs to be placed between the physician requesting an imaging procedure and the performance of that imaging procedure for personal gain provided that radiologists have some freedom to do the most appropriate procedures in any given context.

Summary

AC must be part of radiological practice and planning and most experts see promulgation of such criteria as desirable, e.g., the Ottawa "rules" should already be part of good ER practice. In the longer run the incorporation of AC into the order entry process probably offers the greatest hope for practice quality improvement.

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2.6 HUMAN RESOURCES

Several types of technologists, as well as radiologists, contribute to the workforce necessary to provide DI services to Saskatchewan's population of nearly one million. Examinations are performed by technologists and they are 'read' or interpreted by radiologists. A radiologist does not need to be present when a technologist performs plain film radiography; however one must be on site when fluoroscopy, ultrasonography or other more specialized types of DI are performed.[xviii,xix] Thus, an adequate supply of both technologists and radiologists is necessary to meet communities' DI demands.

As mentioned in a previous section, MSB pays for two components of DI services: the technical fee compensates for performing the examination and the professional fee compensates the physician for interpretation. FFS clinics receive fees for whichever services they provide, i.e., if they perform and interpret a test, then they receive both forms of payment, whereas if they simply interpret a film from another clinic, then they receive only the interpretation fee. RHAs develop their annual budget based on exam numbers and they are funded by Sask Health to pay salaries for technical staff to perform the exams, and to pay radiologists for their interpretation services.

The number of radiologists is an important aspect in the delivery of medical imaging services in the province. From a Length of Stay (LOS) report (2004) it notes there are 60 radiologists in Saskatchewan. CIHI (2003) reports that there were 51 radiologists (2000) and 45 (2001) both excluding non-certified radiologists. CHI also reports 49 radiologists, while MSB has identified 64. To better establish this information we were able to call upon the assistance of the radiologists and identify the following in Table 48:

Table 48 – Radiologists (Nov 2004)

Radiologists (Nov 2004)

Location	Number	FTE	Comment
Canora	1	1	
Moose Jaw	2	2	maybe less
Swift Current	1	1	
Yorkton	1	1	
Regina	12	12	
	1	1	retiring
	3	1.8	3 PT
Saskatoon	2	2	
	2	2	
	9	9	
	14	14	
	2	1	2 PT
Prince Albert	3	2.3	3 PT, share with Llyodminster
North Battleford	2	2	
Melfort	1	1	
Lloydminster	2	1.5	.5 from PA.
Includes Non-Certified radiologists	58	54.6	
Without Non-Certified radiologists	54	50.6	

Summary with the assistance of Dr. Lembke, Dr. Burbridge and secondary sources.

Further lists are available in *Appendix 7 - Radiologists Provincial Lists, and Appendix 8 - MSB Provincial Physicians' List.*

[xviii] In special circumstances some technicians have received approval to perform a specified percentage of exams without the presence of a radiologist.

[xix] The advent of web-based medicine and PACS will allow real time imaging viewing from a remote location and will most likely change the requirement that the radiologist be physically present.

In addition, there were also five nuclear medicine physicians in 1993, dwindling to four at present. Three types of comparative measures indicate that radiologist numbers are relatively low when compared to the rest of Canada:

- Using a range of 49 – 64 radiologists, the percentage of Canada's radiologists practicing in Saskatchewan compared to the percentage of Canada's population living in Saskatchewan: 2.6% - 3.4% (49/1903 and 64/1903 respectively) of Canada's radiologists serve 3.2% (995/31,000) of Canada's population living in Saskatchewan. Using the 54.6 FTE (table 48), Saskatchewan would have 2.9% of Canada's radiologists supporting 3.2% of the population.
- The number of radiologists per capita range from 4.9 – 6.4 radiologists per 100000 population in Saskatchewan compared with 6.1 radiologists per 100000 population in all of Canada. A 5.4 per 100000 would be below the average.
- The number of services provided by radiologist per annum: Radiologists in Saskatchewan provided on average, 18,900 – 24,700 services in 03/04 whereas those in Canada as a whole provided 16,300 (31,000,000/1,900) on average.
- The CAR suggests using 13,500 as a guide per radiologist per annum.
- Based on the number of radiologists per capita and number of services per radiologists, it would seem to suggest that approximately 60-61 radiologists may be consistent with Saskatchewan requirements. However, due consideration should be given to the skills required, location, level of specialization, and the level of technology that is available.

Radiologists also work long hours: those who responded to the survey utilized by this review, reported that they work on average 10 hours per day, or 51 hours per week.

The following statistics describe the length of practice for the radiologists currently working in Saskatchewan:

Maximum:	35.0 years
Mean:	12.5 years
Median:	11.0 years

While it may be difficult to recruit radiologists to Saskatchewan these figures suggest employment longevity, as more than half the radiologists stay eleven years or longer.

Radiologists working in FFS facilities are paid standardized fees according to the Physician Payment Schedule of The Saskatchewan Medical Care Insurance Payment Regulations[xx]. Radiologists in public facilities are paid a combination of salaries and fee-for-service compensation, but these vary from region to region. In some regions the radiologist is paid a fixed salary, which does not depend on the volume of workload performed. In other regions the radiologist is paid for reading the number of exams that was established in the facility's budget beforehand. Participants in this review, both administrators and radiologists, noted that the payments from hospitals for same services differ from region to region, thus radiologists would earn different amounts for performing same number and type of tests.

Radiologists in Saskatchewan's urban centers are certified, having completed residency in radiology; however, in the rest of the province there are a number of non-certified,

[xx] The Saskatchewan Medical Care Insurance Act.

radiologists (restricted to practice radiology – PPR). There are also reports that on occasion new DI equipment is installed without radiologists having the benefit of additional training.

Trends and Issues:

Recruitment and Retention:

Repeatedly, respondents to the various forms of interviews in this review reported a huge shortage of radiologists. They appreciate that efforts have been made to attract physicians to the province, but the efforts have produced little. One radiologist reports having to find and arrange his own locum coverage, with little or no administrative support. An administrator reports that it is almost impossible to recruit less than a full-time radiologist, a requirement that his RHA faced for some time. It is also difficult to attract radiologists to a region where the compensation is based on a fewer number of examinations than in a region with larger needs. All of these concerns point to the need for a human resource strategy, combined with funding incentives, which addresses each region's particular needs from a province-wide perspective. *See Appendix 9 – Current Recruitment and Retention Programs.*

Payment differentials from region to region:

Radiologists working for a RHA are either paid a fixed salary or they are paid to interpret an established number of exams. These methods of compensation are not considered to be equitable. Each RHA that pays radiologists to interpret exams has established its contract independent of other RHAs. Therefore again, there are inequities in payment rates.

Education and training:

This issue of non-certified radiologists is a reality in a province that possesses such recruitment deficits. Also the perception that radiologists are being asked to perform new DI technologies without additional, comprehensive training may be a significant issue.

Technologists

Approximately 445[xxi] technologists are paid salaries to perform various types of DI examinations in Saskatchewan's public facilities. This number includes medical radiation technologists (MRT),[xxii] nuclear medicine technologists and sonographers, as well as DI department administrators. MRTs who perform CT exams take additional training and those who administer MRI exams complete a certified MRI program. There are 449 MRTs who are registered with SAMRT[xxiii] and 79 sonographers who are registered with SADMS[xxiv]. (It is not possible to define how many technologists work in FFS clinics, as some may not be registered with either professional association and there are no union statistics to draw upon.)

[xxi] This figure comes from audited numbers from Sask Health, but differ slightly from those reported by regions.
[xxii] MRTs are registered with and regulated by the Medical Radiation Technologists Act.
[xxiii] Saskatchewan Association of Medical Radiation Technologists.
[xxiv] Saskatchewan Association of Diagnostic Medical Sonographers.

Trends and Issues

Recruitment and Retention

The shortage of DI technologists was a consistent theme across all health regions. The regions are seeing their staff leave their employment to practice in other provinces and in private clinics within the province for more attractive compensation packages. Private clinics outside the province not only attract patients, but also qualified personnel. One third of the 449 technologists registered with SAMRT are between 45 and 65 years of age. The Sask Health initiative on Human Resource planning, recently identified that the age distribution of MRTs (2001) is increasing in the over 35 age group, particularly in the 45 - 54 range. The net migration of the > 35 age group also appears to be higher than other age groups. Many regions reported that they expect a significant proportion of their MRTs to retire within the next 5 years, exacerbating staffing problems.

Remuneration Issues

Technologists working in the public environment are required to hold membership in the union and earn standardized salaries. In December 2001 a Market Supplement Program was initiated to help health care employers attract and retain qualified personnel. The program addressed skill shortages by use of temporary market supplements that were to be applied only when other initiatives had failed and there was evidence that the recruitment problem was affecting service delivery. These supplements were applied to MRI technologists, nuclear medicine technologists and sonographers with reports of significant success. The Sask Health initiative on Human Resource planning, recently identified that the gross earnings for MRTs (2000) were well below the national average and adjacent provinces, while this is apparently not the case for sonographers. Some of these adjustments are due to expire in December 2004, and are expected to worsen if market supplements are not extended.

Education and Training

The absence of a provincial training school for sonographers is felt to have significant impact upon the availability of this group. Almost every region expressed concern about maintaining an adequate supply of sonographers. DI administrators also expressed concerns about the need for more ongoing education, as examinations that used to be “nice to have” are now deemed essential.

2.7 EQUIPMENT (MAJOR MEDICAL IMAGING)

Saskatchewan DI services are provided by both publicly-funded, hospital-based facilities and FFS clinic facilities. These services cover a comprehensive range of DI procedures which support various clinical programs. Services include general radiography, fluoroscopy, tomography, angiography, MRI, CT, mammography, screening mammography, ultrasound, nuclear medicine, and cardiac catheterization labs. These services are provided and managed by a variety of health care professionals including imaging technologists, imaging managers, nursing staff, radiologists, nuclear medicine physicians, and cardiologists. Additional physician support for specific services is provided by general practitioners, and specialists in paediatrics, internal medicine, orthopaedics, and obstetrics/gynecology.

2.7.1 Hospital-Based DI Services (Public)

A comprehensive range of DI services provides the necessary support for hospital-based inpatient and outpatient clinical programs in Saskatchewan. These services range from routine DI procedures to specialized diagnostic and image-guided interventional procedures. A variety of imaging modalities ranging from general radiographic to sophisticated cross-sectional imaging systems are located throughout the province. Table 49 provides an overview of the number of imaging devices by modality in the province.

Table 49: Number of DI Devices by Modality in Public Facilities

Modality	Total
General Radiography Unit	151
General Radiography, Mobile	38
General Radiography, Tomography	6
Fluoroscopic R/F	48
Mobile Fluoroscopic C-Arm	18
Angiographic Suite	5
Cardiac Catheterization Unit	4
CT Scanner	11
MRI Scanner	3
Ultrasound	64
Nuclear Medicine	14
Bone Density	4
Urology	4
Mammography	9
Lithotriptor	1
Total	380

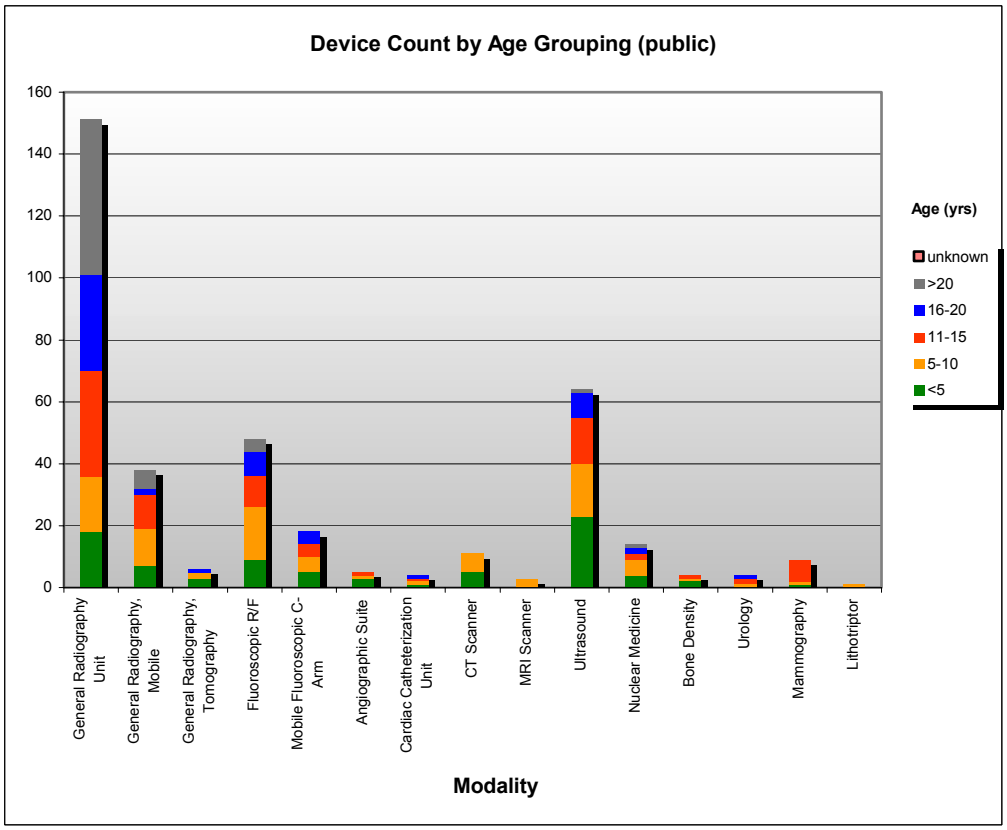
Using table 49 above, it is noted that this listing accounts for 78.5% of the total diagnostic imaging devices in the province of Saskatchewan. The following table 50 provides a further overview of the number of devices by DI modality and by age group. Further information notes the mean, mode and maximum age by modality.

Table 50: Modalities by Age of Equipment in Years (public)

MODALITY	<5	5-10	11-15	16-20	>20	unknown	Total	Mean	Mode	Max
General Radiography Unit	18	18	34	31	50		151	16.1	23	38
General Radiography, Mobile	7	12	11	2	6		38	11.6	11	30
General Radiography, Tomography	3	2		1			6	7.2	4	17
Fluoroscopic R/F	9	17	10	8	4		48	10.4	5	26
Mobile Fluoroscopic C-Arm	5	5	4	4			18	9.9	3	18
Angiographic Suite	3	1	1				5	6.0	3	13
Cardiac Catheterization Unit	1	1	1	1			4	9.3		16
CT Scanner	5	6					11	4.4	6	9
MRI Scanner		3					3	5.0	5	5
Ultrasound	23	17	15	8	1		64	8.2	3	25
Nuclear Medicine	4	5	2	2	1		14	8.8	3	22
Bone Density	2	1	1				4	5.8		13
Urology		1	2	1			4	12.5	11	18
Mammography	1	1	7				9	10.6	11	14
Lithotriptor		1					1	7.0	7	7
Total	81	91	88	58	62	0	380	12.0		

It is noted in table above that 208 or 55% of the 380 imaging devices are over 10 years old. Using the above as reference, Chart 1 provides a visual account of the status of diagnostic imaging in the public facilities in Saskatchewan.

Chart 1



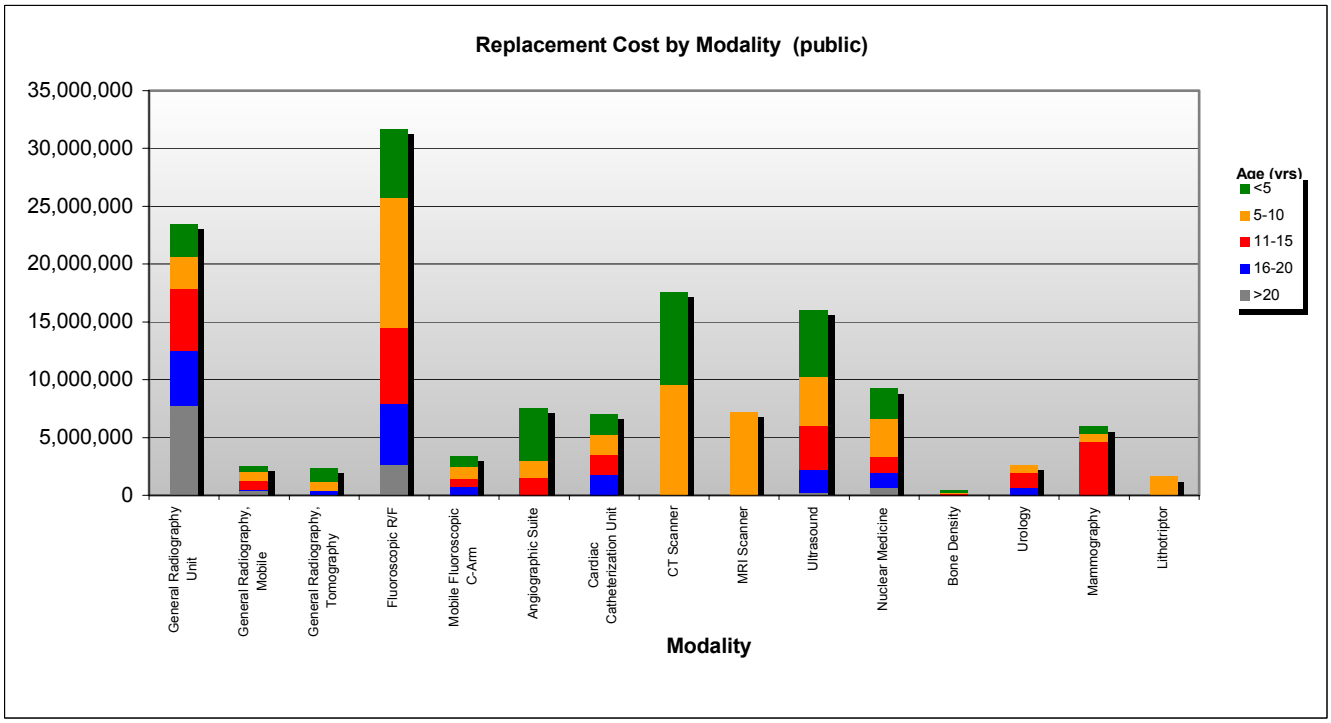
In table 51, an overview of replacement values is provided by modality and the age of the existing DI equipment. This assumes all existing equipment would have to be replaced in the future and does not take into account any change in the utilization mix.

Table 51: Replacement Value by Modality and Age of Equipment in Years (public)

MODALITY	>20	16-20	11-15	5-10	<5	unknown	Total
General Radiography Unit	7,750,000	4,805,000	5,270,000	2,790,000	2,790,000		23,405,000
General Radiography, Mobile	390,000	130,000	715,000	780,000	455,000		2,470,000
General Radiography, Tomography		400,000		800,000	1,200,000		2,400,000
Fluoroscopic R/F	2,640,000	5,280,000	6,600,000	11,220,000	5,940,000		31,680,000
Mobile Fluoroscopic C-Arm		748,000	748,000	935,000	935,000		3,366,000
Angiographic Suite			1,500,000	1,500,000	4,500,000		7,500,000
Cardiac Catheterization Unit		1,750,000	1,750,000	1,750,000	1,750,000		7,000,000
CT Scanner				9,600,000	8,000,000		17,600,000
MRI Scanner				7,200,000			7,200,000
Ultrasound	250,000	2,000,000	3,750,000	4,250,000	5,750,000		16,000,000
Nuclear Medicine	660,000	1,320,000	1,320,000	3,300,000	2,640,000		9,240,000
Bone Density			110,000	110,000	220,000		440,000
Urology		660,000	1,320,000	660,000			2,640,000
Mammography			4,620,000	660,000	660,000		5,940,000
Lithotriptor				1,600,000			1,600,000
Total	11,690,000	17,093,000	27,703,000	47,155,000	34,840,000	0	138,481,000

From the table above, it is noted that the budgetary replacement costs for equipment over 10 years old is $56.5M or 40.8% of total $ value, which encompasses 55% of the number of public imaging devices. Chart 2 below illustrates a visual overview of these replacement costs.

Chart 2



Using table 52 below, we note that a significant percentage of the existing equipment has exceeded its maximum life expectancy, as defined by industry standards as well as the lifecycle guidelines recommended by the Canadian Association of Radiologists (CAR). When machines exceed their maximum life expectancy, concerns arise related to equipment age, availability of parts, utilization capabilities, upgrade ability, clinical relevance, operational reliability and performance, safety, redundancy, serviceability, and increased operational costs. Many of these issues lead to unplanned downtime which impacts patient access. Also, the need for unplanned equipment replacement can result in a reduction in the available services and can lead to increased waiting times. In addition, many of the older DI machines could not be converted to a PACS-based system as they are not DICOM[xxv] compliant.

Table 52 – Example of Lifecycle Replacement Options

Equipment Description	10 Year Lifecycle (Years)	2001 CAR Lifecycle Guideline (Years)
General Radiography Unit	10	5-10
General Radiography Mobile	10	5-10
General Radiography Tomography	10	5-10
Fluoroscopic R/F	10	5-10
Mobile Fluoroscopic C-Arms	10	5-10
Angiographic Suites	10	7
Cardiac Catheterization Labs	10	7
CT	10	8
MRI	10	6
Ultrasound	10	6
Nuclear Medicine	10	10
Bone Density	10	6
Urology	10	10
Mammography	10	5-7
Lithotriptor	10	7

2.7.2 FFS Facilities

FFS DI facilities play an important role in supporting the provincial DI infrastructure and support the public, hospital-based system, by providing services in general radiography and fluoroscopy, ultrasound, and diagnostic mammography. These FFS facilities account for 21.5% of the province's DI devices and 16% of the overall dollar value of the existing installed base. (*See Appendix 10 – DI Modalities.)*

The following table 53 provides a further overview of the number of devices by DI modality and by age group. Further information notes the mean, mode and maximum age by modality.

[xxv] DICOM is the acronym for the Digital Imaging and Communications in Medicine standards created by the National Electrical Manufacturers Association to aid the distribution and viewing of medical images.

Table 53 - provides a summary of DI modalities that are located within FFS health care facilities.

Modality	Total
General Radiography Unit	49
General Radiography, Mobile	
General Radiography, Tomography	
Fluoroscopic R/F	6
Mobile Fluoroscopic C-Arm	
Angiographic Suite	
Cardiac Catheterization Unit	
CT Scanner	
MRI Scanner	
Ultrasound	40
Nuclear Medicine	
Bone Density	2
Urology	
Mammography	7
Lithotriptor	
Total	104

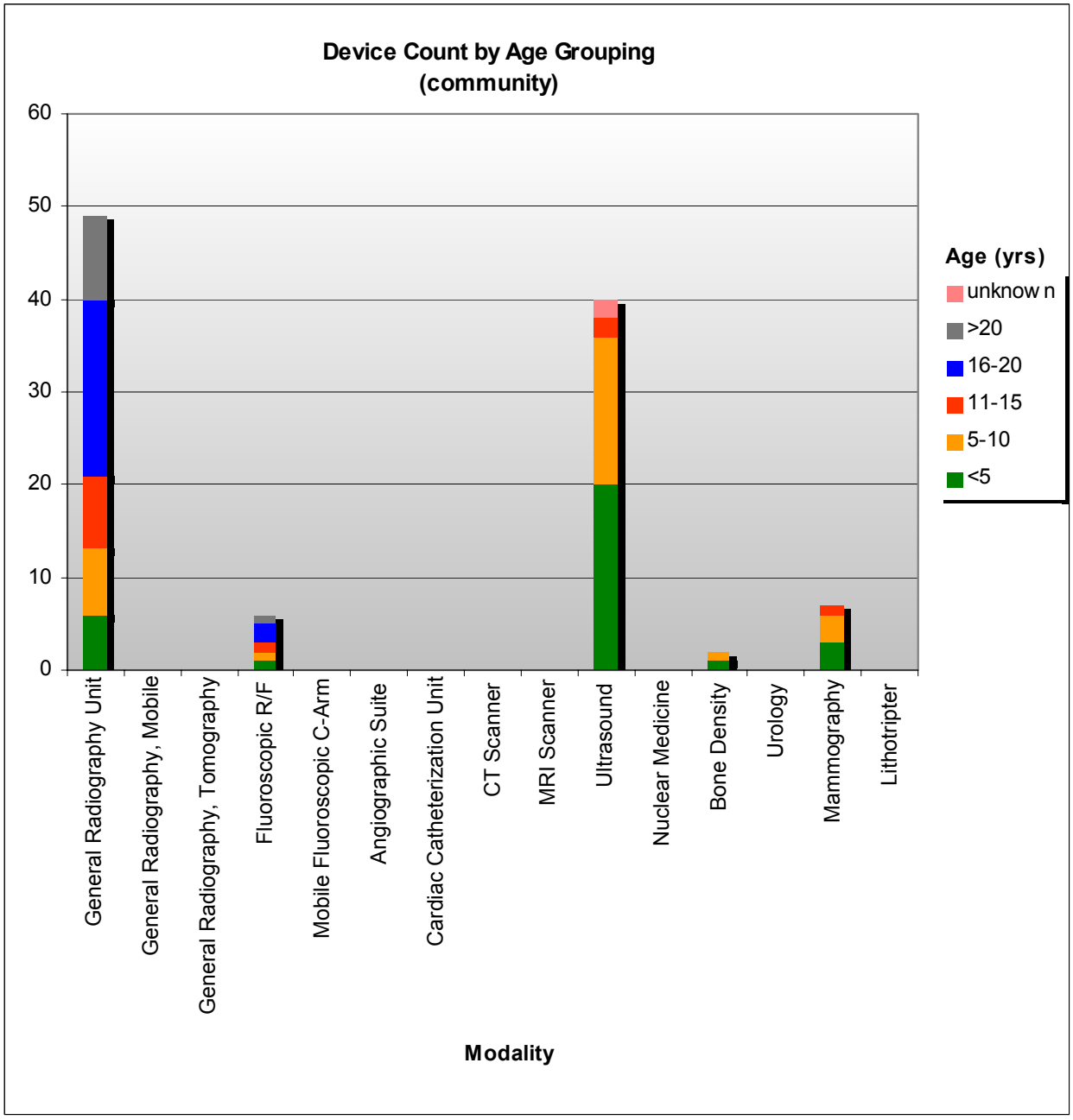
The following table 54 provides a further overview of the number of devices by DI modality and by age group. Further information notes the mean, mode and maximum age by modality.

Table 54 – DI Devices by Modality and Age of Equipment in Years

MODALITY	<5	5-10	11-15	16-20	>20	unknown	Total	Mean	Mode	Max
General Radiography Unit	6	7	8	19	9		49	15.0	18	30
General Radiography, Mobile										
General Radiography, Tomography										
Fluoroscopic R/F	1	1	1	2	1		6	15.2		34
Mobile Fluoroscopic C-Arm										
Angiographic Suite										
Cardiac Catheterization Unit										
CT Scanner										
MRI Scanner										
Ultrasound	20	16	2			2	40	4.6	3	15
Nuclear Medicine										
Bone Density	1	1					2	7.0		10
Urology										
Mammography	3	3	1				7	5.3	0	13
Lithotripter										
Total	31	28	12	21	10	2	104	10.3		

Chart 3 provides a visual account of the status of diagnostic imaging in the public facilities in Saskatchewan.

Chart 3



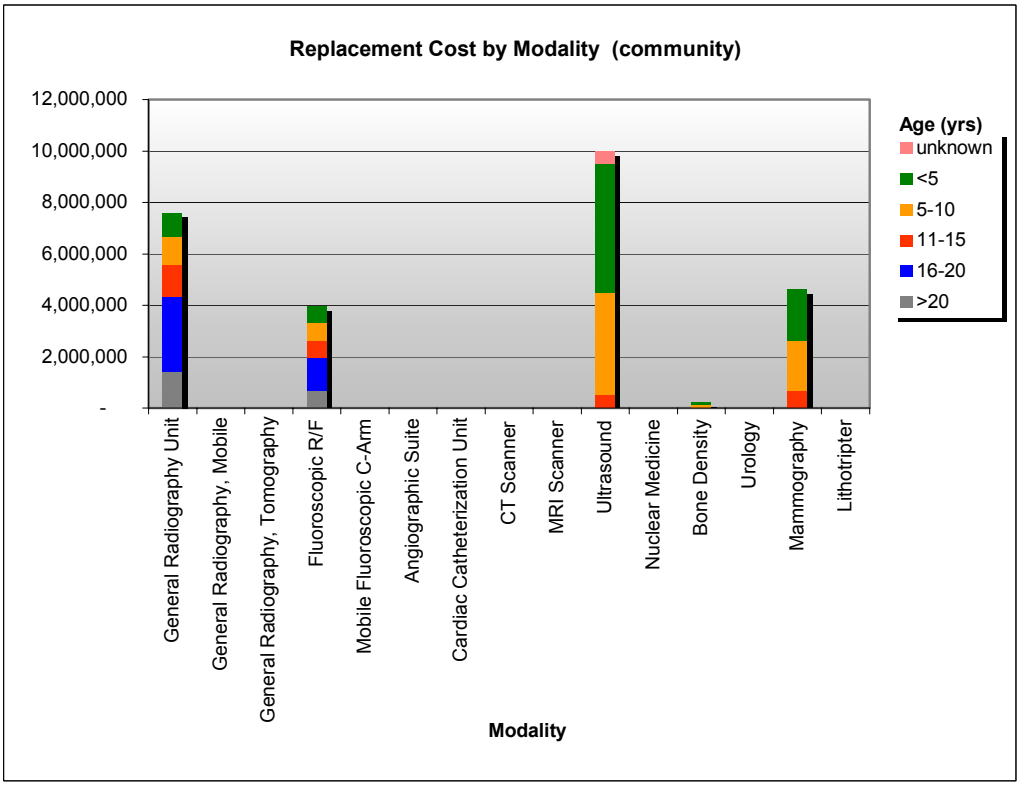
In table 55, an overview of replacement costs are provided by modality and the age of the existing DI equipment. This assumes all existing equipment would have to be replaced in the future and does not take into account any change in the utilization mix.

Table 55: Replacement Cost by Modality and Age of Equipment in Years (FFS)

MODALITY	>20	16-20	11-15	5-10	<5	unknown	Total
General Radiography Unit	1,395,000	2,945,000	1,240,000	1,085,000	930,000		7,595,000
General Radiography, Mobile							
General Radiography, Tomography							
Fluoroscopic R/F	660,000	1,320,000	660,000	660,000	660,000		3,960,000
Mobile Fluoroscopic C-Arm							
Angiographic Suite							
Cardiac Catheterization Unit							
CT Scanner							
MRI Scanner							
Ultrasound			500,000	4,000,000	5,000,000	500,000	10,000,000
Nuclear Medicine							
Bone Density				110,000	110,000		220,000
Urology							
Mammography			660,000	1,980,000	1,980,000		4,620,000
Lithotripter							
Total	2,055,000	4,265,000	3,060,000	7,835,000	8,680,000	500,000	26,395,000

From the table above, it is noted that the budgetary replacement costs for equipment over 10 years old is $9.4M or 35.5% of total assets, which encompasses 31.7% of the number of FFS imaging devices. Chart 4 below illustrates a visual overview of these replacement costs.

Chart 4



As in the public sector, much of the medical imaging equipment that is being utilized in the FFS sector has exceeded its maximum life expectancy (as defined by industry standards and CAR). Although general radiology systems are robust, and many have had their operational lives extended beyond recommended guidelines, reliability concerns exist.

Summary

Currently, DI services in the province of Saskatchewan is comprised of 484 imaging devices of which 380 (78.5%) are located in RHAs and a further 104 (21.5%) are located in FFS facilities.

Total replacement value of both public and FFS imaging devices is estimated at $165.0M. Of this total, public DI imaging equipment accounts for approximately $138.5M (84%) of the total replacement value, while the FFS sector accounts for the balance of $26.5M (16%).

Of the total workload for '03/04, public facilities accounted for 839,999 exams of the total of 1,211,082 services (69.3%), while FFS facilities account for the balance of 371,083 services (30.7%). This excludes other insured services that may be done in RHAs and FFS facilities.

Of the 380 public imaging devices, 54.7% of the equipment is greater than 10 years old, requiring 40.8% of the estimated budget replacement value or $56.5M.

Of the 104 FFS imaging devices, 41.3% of the equipment is greater than 10 years old, and would account for 35.5% of its estimated replacement value or $9.3M.

2.7.3 Equipment Replacement Programs

Capital equipment requirements in each RHA are reviewed on an annual basis and regional priorities are submitted to the Saskatchewan Health Regional Policy Branch for approval of funding. DI is one of many departments that vie for provincial funding. Yearly funding for DI has generally been in the $3 million range, and these monies are distributed among the various RHAs. In addition to provincial funding, most RHAs have implemented independent fund-raising initiatives through registered non-profit hospital and regional trust funds to augment provincial funding. Additional funding has also been provided through federal transfer payments and/or special allocations. In fiscal years 03/04, 04/05, and 05/06, an additional $16 M was provided annually through transfer payments. Although there is some priority consideration, equipment is generally purchased by each region on an "as needed and funded basis". Recently, a collaborative capital equipment replacement program and tendering process for CT scanners was initiated amongst the regions to maximize their buying power.

At the November 18, 2004 DI Steering Committee meeting, it was noted that the Provincial Government has recently allocation of $20.7M from the First Ministers Accord ($66.0M allocation to Saskatchewan) to the Diagnostic Imaging. In addition, further funding will be assigned to DI over the next three years.

FFS facilities receive no capital funding for equipment replacement and they must upgrade their infrastructure through a portion of the technical fee paid from insured billings.

2.7.4 Equipment Servicing

Maintenance on DI equipment is provided by either the original equipment manufacturers (OEMs) or by in-house, biomedical support staff. There is evidence of some preventative maintenance programs for DI equipment in some of the urban regions at the present time.

2.7.5 Radiation Protection

DI systems are classified as to their level of energy transmission coupled with their invasive absorption properties. DI devices are constantly monitored to ensure that they function properly with respect to the manufacture's technical specifications, and within the specified parameters of the classification rating. Regulatory control for radiation protection in the province of Saskatchewan falls under the jurisdiction of the Saskatchewan Department of Labor's Occupational Health and Safety Board. The Radiation Protection Unit is responsible for ensuring that an annual radiation protection survey on all DI equipment in the province is performed. These inspections are carried out by licensed inspectors who have been trained and are qualified to do this type of work. The Radiation Protection Unit, staffed by a physicist and a manager, monitors all reports submitted.

Note: The *Radiation Protection Act* pertaining to DI systems and the Department of Saskatchewan Labor, Radiation Safety Unit Action plan 04/05 have been included in the appendices (*Appendix 11 – Radiation Protection Act*).

2.8 INFORMATICS

Introduction

DI has undergone a significant transformation over the past several decades. Although there have been numerous advancements in DI technology, these pale in comparison to the impact informatics has had on the entire health care community. Informatics encompasses an assortment of integrated "electronic" functions with respect to the collecting, editing, administrating, auditing, and assembling patient data and demographics, as well as the managing and auditing of administrative functions.
The concept of informatics has evolved considerably. Initially, the prime functions of informatics systems were the managing and auditing of patient demographics and histories as well as hospital management and administration functions; these systems were known as Hospital Information Systems (HIS). Additional informatics modules were added to the HIS, specific to various clinical programs such as radiology, (RIS) and the laboratory, (Laboratory Information Systems (LIS)).

A dedicated software code known as Hospital Level 7 (HL7) was developed to serve as a global standard for HIS and their modules and IHE for standardization of data. In addition to HIS, supporting the evolution of the "electronic" information systems, radiology has migrated away from a film-based environment to an electronic "film-less" environment, commonly known as PACS. PACS provides for the "electronic" capture, archiving, and viewing of images on an enterprise-wide level and has the ability to integrate directly with both HIS and RIS modules, allowing for seamless integration of patient information and images. The next generation of informatics systems is the Electronic Medical Record (EMR), incorporating HIS, RIS/ PACS, LIS, and other information modules to create a comprehensive patient history database.

Mandate for a Provincial RIS/PACS Initiative

Saskatchewan Health, in conjunction with Canada Health Infoway (CHI), has undertaken a provincial RIS/PACS initiative, aiming to:

- identify and align implementation with the directions outlined by RHA DI services strategies and the provincial DI services strategy;
- ensure alignment with the directives of the Saskatchewan Action Plan for Health;
- oversee all aspects of RIS/PACS initiative strategy development and uptake along with subsequent project planning and project oversight activities;
- set and adjust its strategy, priorities, and scope, while considering the impact on time, schedule, and budget;
- identify and leverage possibilities for economic use of shared infrastructure components, provided service quality to the RHAs and their clients is maintained;
- champion the initiative, both within representative organizations and other stakeholder organizations;
- identify and communicate the strategy and status of the initiative with provincial stakeholder organizations.

It was noted that Canada Health Infoway (CHI) would make a final decision on the level of support for the Saskatchewan RIS/PACS initiative on November 29, 2004.

2.8.1 Current Environment

This section describes the current DI environment in the seven participating RHAs (of 13) and defines the situations, processes, and methods that each region uses to deliver and support their DI department Content related to the current status of HIS/RIS, PACS, and network within the RHAs has been provided by the Saskatchewan Health Information Network (SHIN) as outlined in their Saskatchewan RIS/PACS Current Status Report, September 1, 2004.

Saskatoon Health Region

Saskatoon Health Region is using iSite Enterprise to share images with users throughout the province and also runs the Cerner QuadRIS system. There is an intent to upgrade to the Cerner Millennium product sometime in the future. The RHA is also in the process of integrating the QuadRIS system to the iSite Enterprise product. (See interfacing in the Technology section.).

Regina Qu'Appelle Health Region

Regina Qu'Appelle Health Region is using iSite Enterprise to share images with users throughout the province.

Prince Albert Parkland Health Region

Prince Albert Parkland Health Region uses decentralized registration, [xxvi] so patients are entered into the information system (a product of RISE Health Systems, Calgary) when they arrive in the DI Department. The RHA has set each modality up as a provider in RISE, therefore patient visits can be scheduled and the system can be used to collect and report workload data. Transcribed reports are attached to the patient record and are available for viewing in the system. The tool cannot track inventory, staff scheduling (they use Total Care's ESP), digital voice recording, on-line verification/digital signature/auto-send of reports, nor label printing (due to thin client (Citrix) limitations).

Five Hills Health Region

Moose Jaw, in the Five Hills Health Region, has manual processes in the DI department. They use three-part paper requisition forms and have a paper day-sheet for statistics that is transcribed into Microsoft Excel at the end of each day, as well as a paper scheduling system for patients. When X-rays are required, a flash card is typed on a manual typewriter. The "Note" section in a patient record in WinCIS is used to track DI visits, and also to record which films are loaned out. Transcriptionists in the department enter reports into Microsoft Word and then print the final reports on the requisition form using an impact printer. The ultrasound worksheet is included in the film bag and retained as part of the patient record.

Cypress and Sunrise Health Regions

Swift Current, in the Cypress Health Region, and Yorkton, in the Sunrise Health Region, use a custom-built application called DI Information Manager,(developed by a firm in Swift Current) which captures patient demographics, examination information (including interpretation), and the name of the ordering physician. The application also has fairly extensive reporting ability, but does not directly interface to any other applications in the region. Sunrise Health Region contracts their staff so they also use the application for

[xxvi] In all hospitals examined for this review, except in the Prince Albert Parkland Health Region, patients go to the Admitting Department before they go to the DI Department.

billing purposes (an enhancement they requested and paid for). Swift Current does not use this functionality since all of their staff are on their payroll.

Prairie North Health Region

Prairie North Health Region has a "mini-PACS" called the Toshiba Galileo system, with two radiologist workstations and a stand-alone server. All digital images from the digital fluoroscopy and ultrasound machines are archived. A client information system from Manitoba, WinCIS, is used for capturing patient visits and exam type. All bookings are done manually, as is film loan-out. Reports are typed in Microsoft Word and printed. Original requisitions are attached to these reports and sent to health records.

2.8.2 Support Capabilities

Most information technology (IT) staff can be found in the Health Information Solutions Centre (HISC), a branch of Saskatchewan Health assisting health regions in integrating health service delivery and in the two largest regions. The IT staff complements for each region or organization are:

- RQRHA 40
- Saskatoon 37
- HISC 75 (about half are contract staff)
- Other regions 1 to 4 each

Due to the low number of IT staff in some of the smaller regions, the two larger regions have established formal and informal working relationships with them to provide everything from consulting services to the hosting of applications.

HISC currently hosts and supports a number of clinical systems for RHAs including the WinCIS and RISE ADT systems, the TriWin LIS, the WinPharm pharmacy system, and the Procura home care system for at least the five mid-sized regions (Five Hills, Cypress, Sunrise, Prince Albert Parkland, Prairie North). These time-sensitive, clinical systems are used 24 hours per day every day. HISC also hosts and supports MDS for Long Term Care for the majority of the regions in the province (including RQRHA and Saskatoon).

Regina Qu'Appelle Health Region, Saskatoon Health Region and HISC each have the technology, staff, processes, and infrastructure capabilities to host and support centralized RIS and PACS systems. Decisions about which organization(s) will host or manage the systems on an ongoing basis will be made in Phase 0 and be finalized in Phase 1.

2.8.3 Current RIS and PACS Implementations

This section deals with currently installed technical DI infrastructure.

Table 56 - Systems Implemented in Each Region

RHA	ADT/HIS	RIS	Image Viewer	Transcription	EMR
Saskatoon	EnOvation	Cerner QuadRIS	Stentor iSite Enterprise	Dictaphone	SCM
RQRHA	EnOvation	-	Stentor iSite Enterprise	Dictaphone	-
Prince Albert Parkland	RISE HealthSuite	RISE HealthSuite	-	Dictaphone	-
Five Hills	WinCIS	-	-	Dictaphone	-
Cypress	WinCIS	DI Information Manager (Custom built)	-	Dictaphone	-
Sunrise	WinCIS	DI Information Manager (same software as Cypress)	-	Dictaphone	SCM
Prairie North	WinCIS	-	-	Dictaphone	-

2.8.4 Integration with Other Systems

Saskatoon Health Region

The Saskatoon Health Region is currently interfacing QuadRIS to iSite Enterprise, thus allowing iSite users access to transcribed radiologists' reports. The RIS system will be interfaced into the clinical data repository (Sunrise Clinical Manager (SCM)) once the provincial RIS is implemented. In this region, EnOvation HIS, Dictaphone transcription system, and SoftLab LIS are interfaced to SCM allowing SCM to contain patient visit histories, lab results, and transcribed reports.

Regina Qu'Appelle Health Region

The Regina Qu'Appelle Health Region has interfaced its EnOvation HIS to several of its clinical systems, e.g., the LIS, as in Saskatoon.

Prince Albert Parkland Health Region

Prince Albert Parkland Health Region's RISE Healthsuite and Dictaphone systems are interfaced and integrated. For example, radiologist reports are available under a patient record.

Five Hills Health Region

Five Hills Health Region has an interface built between its ADT system and its LIS.

Sunrise Health Region

The Sunrise Health Region is currently interfacing the WinCIS ADT system and the TriWin LIS into SCM.

Cypress and Prairie North Health Regions

These RHAs have not interfaced their clinical systems at this time.

Provincial Systems

The Provider Registry is implemented in Saskatchewan but currently does not interface directly to any system. Updates to the Registry are provided to Saskatoon Health Region as the information is received. The information is stored in the Saskatoon Health Region database, which is used to update information across their clinical systems.

2.8.5 Standards Used by Current RIS and PACS Implementations

The RHAs have agreed to be IHE[xxvii] compliant, and their recent modality purchases have met DICOM standards. A reference architecture has been developed which is used as a guideline for architectural and design decisions. Included in the document are design principles, and standards such as HL7 for clinical system interfaces, and IHE for standardization of data transfer internationally, Windows for operating systems, TCP/IP network protocols, and use of Cloverleaf as the interface engine.

2.8.6 Network Infrastructure Available to Support RIS and PACS Province-wide

Community Net is a provincial wide-area network connecting virtually all government-funded health, education, and executive government facilities. Regina, Saskatoon, and Prince Albert are connected at 100Mb speeds, the other facilities at 10Mb. All but the smallest communities are connected with a minimum of 640Kb.

2.8.7 Management of Hardware and Network Elements

HISC is responsible for Community Net. The RHAs are responsible for the networks within each community. Service Level Agreements are in place between HISC and the regions for Community Net.

HISC hosts some clinical applications (e.g., CPI/Registration, clinical laboratory, Home Care) used in 5 regions (FHHR, CHR, SHR, PAPHR, PNHR), as well as other provincial applications.

Saskatoon and Regina Qu'Appelle Health Regions each host the full spectrum of applications used in their RHAs (with one or two exceptions – e.g., MDS Long Term Care, Renal Data Management System).

Comment

While the intent of the RIS/PACS initiative is to be province-wide, it currently only includes 7 of 13 RHAs, although these regions account for approximately 85% of RHA workload. Excluded areas include the remaining 6 RHAs, cardiac services, and all FFS sites that provide general radiology, ultrasound, mammography, screening mammography, and bone density scanning. To maximize the benefits to patients, caregivers, and the province overall, a strategy must be developed to bring all services together in this initiative.

[xxvii] IHE Canada is a not-for-profit organization that promotes and facilitates the adoption of IT standards among Canada's healthcare communities; it is endorsed by CAR and the Information Technology Association of Canada (ITAC).

2.9 MAGNITUDE OF COSTS

As noted in sections 2.7 and 2.8, Saskatchewan's inventory of public DI equipment has a replacement value of approximately $139 million. Maintaining and updating the capital stock represents a significant cost. This cost driver is further compounded by the effect of technological change. Computer technology is at the core of modern imaging technology and the evolution of computer hardware and software has resulted in the rapid emergence of new or advanced imaging platforms. Similarly, human resource and demographic imperatives are likely to make investment in RIS/PACS unavoidable.

Quantifying the costs that will be incurred to maintain or redesign Saskatchewan's DI system is exceedingly difficult. Not only have the timeframes for this project made a comprehensive analysis impossible, but there are a host of conflicting forces that could impact costs and no widespread consensus concerning costing standards. Looking to the future it can be expected that some technologies (e.g., CT) will be more widely utilized while the utilization of others (e.g. general radiology and fluoroscopy) will decline. Against these modality specific trends, the application of appropriateness criteria promises to generally reduce utilization. However, this potential saving may well be offset inasmuch as there is some evidence that expansion in specific types of DI equipment results in incremental utilization rather than substitution for other services particularly in freestanding DI facilities.[1]

While it is impossible in the short-term to accurately predict future costs, it is possible to identify magnitude of costs and some of the factors that will impact various categories of cost.

2.9.1 Implementation of Potential Initiatives

In subsequent sections of this report we will emphasize a systems approach to the organization, financing and delivery of DI services. The intent is to build upon existing strengths while providing for improvements in planning and coordination. Options 1-3 identified in section 3 of the report are all designed to advance this end through the establishment of some form of central organization whose mandate could range, depending on the option chosen, from coordination to actual management of services. In all three instances some form of committee or board would be established which would, minimally, oversee certain system-wide projects or initiatives (i.e., development of appropriateness criteria). Regardless of which option is chosen it is expected that the establishment and operation of the committee/board structure and associated project funding would total $750,000 - $1,500,000 per year. While it might be possible to redirect existing resources to this purpose, in all likelihood these represent incremental resources.

2.9.2 Capital

There are primarily two requirements for capital funding, equipment acquisition and replacement and RIS/PACS. As already suggested, significant capital expenditure may be relatively unavoidable given the age profile of Saskatchewan's DI equipment, as well as technological change and human resource imperatives.

2.9.2.1 Equipment

There is no clear consensus regarding the useful life of DI equipment. As noted earlier in this report, industry norms frequently suggest a 10-year useful life while the CAR suggests 5-10 years depending on the type of equipment. The CAR application of differing useful life standards by DI modality makes sense from a technological obsolescence perspective but we are left with the dilemma that technological and functional obsolescence may occur at different points in time. Emphasis on technological obsolescence almost certainly shortens the predicted life of some types of equipment.

Research in Australia suggests the cost-weighted life expectancy of medical equipment to be 11.4 years.[2] The Australian figure is interesting for several reasons. First, there are some significant similarities between the Australian and Canadian health systems. Second, Australian expectations are 25 – 100% greater than American expectation and the latter certainly influence industry norms in North America. Finally, despite being more conservative than Americans regarding the need to replace equipment, the useful life estimate is still relatively short compared to practice in most Canadian jurisdictions.

Table 53, presented on page 66, indicates that 45% of Saskatchewan's DI equipment is ≤ 10 years old, 23% is 11 – 15 years old and 32% is ≥ 16 years old. There are a couple of approaches to estimating, at a fairly gross level, the amount of equipment spending required to update or maintain the capital stock.

The first approach involves focusing on the equipment ≥ 16 years old. There is little doubt old equipment raises issues of reliability, serviceability and clinical relevance. Assuming the equipment ≥ 16 years old is actually needed, there is likely a strong argument that this equipment needs to be replaced as soon as possible at an expected cost of approximately $28.8 million. This argument may also extend to equipment in the 11 – 15 year category, which has a replacement value of approximately $27.7 million. However, the 11 – 15 year category is in some ways less straightforward. Ideally this equipment probably should be replaced but the realities of the demands on government funding need to be acknowledged. In addition, while equipment in this age category may be technically obsolete it may not yet be functionally obsolete.

An alternate approach to calculating required equipment spending is to apply a guideline of some form to the value of the entire capital stock. This approach discounts the often significant financial impact associated with a backlog of equipment due for replacement. Table 57 presents spending estimates resulting from the application of a number of guidelines to Saskatchewan's DI equipment stock.

TABLE 57 Required Annual Spending/Accrual for Equipment Replacement

Life Cycle Guideline	Spending/Accrual Requirement
CAR (5-10 yrs)	$16.8M
Industry Norm (10 yrs)	$13.8M
Australia (11.4 yrs)	$12.1M
15 yrs	$9.2M

Regardless of which approach is used to calculate an equipment spending requirement it is likely that shifting patterns of modality utilization, comprehensive technology assessment and placement planning, group-purchasing initiatives etc could mitigate the required spending. However, even if initiatives were introduced to better manage equipment planning and acquisition the age profile of Saskatchewan's equipment suggests significant annual spending will be required.

2.9.2.2 RIS/PACS

There is currently considerable discussion in Canada concerning the introduction of RIS/PACS systems. To some degree the digital nature of modern imaging systems is driving this trend but the concept has merit in its own right as it represents the means to fully exploiting technology. Most importantly, RIS/PACS offer the potential to create virtual imaging networks. Such networks offer the potential to bring the services of radiologists to communities where imaging equipment is in place but radiologists are unavailable. These networks also offer the opportunity to distribute work more evenly across the radiologist workforce. In addition there are operational benefits such as eliminating the need to make hardcopies of images when referring patients to referral centres or having referral centres repeat studies already completed.

Saskatchewan's provincial IT initiative estimates the cost of introducing RIS/PACS to be in the order of $38 million. This figure appears reasonable. In the course of this review a couple of RIS/PACS vendors were contacted re system costs resulting in estimates of $26 - $52 million. Training costs would likely have to be added to these figures. Other jurisdictions have suggested these costs are in the order of $2000 per FTE. The bulk of the costs associated with RIS/PACS would likely be spread out over 3 years, however, ongoing support costs could be in the order of $5 million per year.

2.9.3 Potential Offset Benefits

Saskatchewan is probably facing capital costs for equipment replacement and RIS/PACS of approximately $25 million for at least several years. Thereafter the funds required for equipment replacement would be at least $12 million per year. Operating requirements for the committee or board structure recommended to oversee or operate DI services as well as support costs for RIS/PACS are likely to amount to $6.5 - $7.5 million per year.

Health care initiatives have a long history of promising savings but failing to do so. In change projects the magnitude of what is proposed here it is dangerous to suggest what savings might be achieved. Nonetheless there is reason to believe that some efficiencies can be generated.

In terms of new DI equipment the switch to digital platforms undoubtedly offers potential efficiencies in the areas of film and chemistry costs, storage costs, clerical costs, fewer repeat exams etc. In some instances digital technology may even facilitate machine based interpretation of results. Similarly, RIS/PACS is expected to generate $370 million in 'savings' according to Canada Health Infoway. These 'savings' relate just to the cost of repeat exams and/or the need to print duplicate films when patients are sent to referral centres. What portion of these 'savings' might accrue to Saskatchewan is not specified. It should also be noted that Canada Health Infoway will contribute to the cost

of implementing RIS/PACS in Saskatchewan, a consideration not reflected in the costs mentioned above.

Whether investment in new equipment and RIS/PACS will generate 'cost savings' or simply result in 'cost avoidance' is a consideration that should not be overlooked. While actual productivity gains must come from rigorous observation and measurement, the shift from manual management and imaging methodologies to paperless and filmless environments will have a significant impact on day-to-day radiologist, technologist and clerical functions. Given waitlists for DI exams and shortages of personnel it is very likely that efficiencies gained through investment in equipment and RIS/PACS will simply be redirected to addressing current demand. As such, efficiencies gained will be translated into 'cost avoidance' as opposed to 'cost savings'. The need to invest additional funds to perform additional workload should be minimized. This is a benefit in its own right but does not impact current cash flow in the manner cost savings would.

There are a number of policy initiatives that would also impact the cost equation. These include an integrated approach to service planning in public and FFS facilities, the introduction of rigorous technology assessment and placement planning, the introduction of appropriateness criteria and the introduction of alternative procurement strategies such as group purchasing. In British Columbia group purchasing initiatives resulted in equipment prices 25% below pre-purchase estimates and below pricing levels obtained by the largest American hospital chains.

References

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3.0 ISSUES AND RECOMMENDATIONS

During this review, many issues concerning the state of DI in Saskatchewan were identified. These arose during focus group meetings, interviews, discussions with user groups, reviews of background information, and from feedback solicited through an on-line survey directed to specific groups.[xxviii] Many of these issues arose repeatedly and have been discussed in previous sections of this report. This section will present an overview of the issues, background information, alignment requirements and recommendations. This section is organized into six categories:

3.1 Strategic goals, Objectives, Management and Organization

3.2 Access and Demand Management

3.3 Human Resources

3.4 Consultation and Appropriateness

3.5 Imaging Technology and Informatics

3.6 Funding and Reimbursement

[xxviii] The specific groups included referring physicians (list provided by the College of Physicians and Surgeons); medical providers (radiologists and nuclear medicine physicians) working in public (RHA), private (FFS), and academic environments; all RHA CEOs; and all RHA DI managers and their staff.

3.1. STRATEGIC GOALS, OBJECTIVES, MANAGEMENT AND ORGANIZATION

3.1.1 Strategic Goals and Objectives Issues

Physicians and technical support personnel report that there is insufficient communication among the parties with interests in DI, e.g., Sask Health, RHA administrations, staff in individual departments. This situation can lead to a lack of shared understanding and an environment of mistrust.

In particular, during the course of the review it was noted that there is a need for:

- strategic direction for DI from a provincial perspective;
- strategic goals and objectives for DI departments that are consistent with RHA and hospital directions;
- a more harmonized approached to the delivery of care by community and hospital based services;
- articulation with the College of Physician and Surgeons of Saskatchewan's Advisory Committee on Medical Imaging; and,
- a coordinated approach to the assessment and procurement of technology to achieve optimal clinical opportunity and purchase capabilities.

3.1.2. Management and Organizational Structures Issues

The physicians providing DI services report that public and FFS facilities are not well integrated with each other -- there are apparently opportunities to re-apportion services to better utilize technology and better serve patients. Physicians also recognize that even specific DI services within public facilities are not as well integrated with each other as they should be. Lack of integration impedes the efficient utilization of scarce human resource and equipment, and compromises efforts to plan for the population's future needs.

During the course of the review it was noted that there is a need for:

- an approach to delivery of DI services that integrates services delivered through both the public and FFS systems;
- an integrated approach to delivery of DI services within the public sector, e.g. amongst radiology, nuclear medicine, cardiac catheterization;
- consistent representation of issues from stakeholders, e.g. radiology, nuclear medicine, cardiac catheterization, academic sites, private sites;
- a consistent approach to reporting and accountability across the province, including evaluation of DI services and use of common quality measures;
- a plan to manage escalating health care demands and costs; and,
- a coordinated approach to HR management amongst all regions.

3.1.3 Provincial DI Strategy – Governance and Organizational Structure

An effective and efficient governance and organizational structure for DI services will build upon the current inter-relationships amongst the Department of Health, regional health authorities, professional bodies, and the Health Quality Council. However, clarity of the roles and responsibilities within the provincial DI strategy is required.

The Department of Health is responsible for establishing the policy framework and overall planning for the system. This includes overall responsibilities for determining the appropriate level of services throughout the province, planning for future human resource requirements for the system, and development of a strategic plan for assessment of technology, acquisition of equipment, its deployment and maintenance.

Establishing and monitoring province-wide standards for physicians (i.e. radiologists) is the responsibility of the College of Physicians and Surgeons of Saskatchewan and for the quality of services is the Health Quality Council.

Regional Health Authorities are currently responsible for the governance and management of only publicly administered diagnostic services within their geographical area. Some of the options cited below recommend that they be delegated additional authority to assume full responsibility of all DI services within their geographical area. This is not to suggest that the range of services provided by FFS clinics should be curtailed or eliminated. Rather, the options recognize that a greater level of planning, service integration, decision-making and system-wide coordination at the regional level is required to effectively address issues such as wait times and timely adaptation of service mix and levels to meet the changing needs of the public. Regardless of the options identified below, RHAs are accountable for the standard of care within their organization.

A consistent perspective provided throughout this review was the absence of a process to bring together key stakeholders to formulate a province-wide plan for the delivery of diagnostic imaging services. One of the perspectives afforded by this review was the account of an almost complete lack of trust and communication between administrations, physicians, technologists and Provincial bodies in at least one regional health area. No recommendations are likely to address the substantial issues we encountered unless they are accompanied by a realization that the complexities of health care delivery demand a set of responses which are free of prejudice, political interference, self-interest and bias and which are focussed on patient care and academic integrity. Anything less will betray the proud tradition of leadership in health care delivery in Saskatchewan which should inform and sustain the Province as it enters a period of change and challenge which will continue to be the future of health care. All parties need to focus upon the centrality of the patient and his or her concerns as the over-arching reason for not only imaging services but for the health care enterprise as a whole. To do so demands expertise in managing scarce resources and deploying specialist care to the best advantage. That is unlikely to be achieved without a degree of integrity and mutual respect between all parties involved in this review and not always so far in evidence.

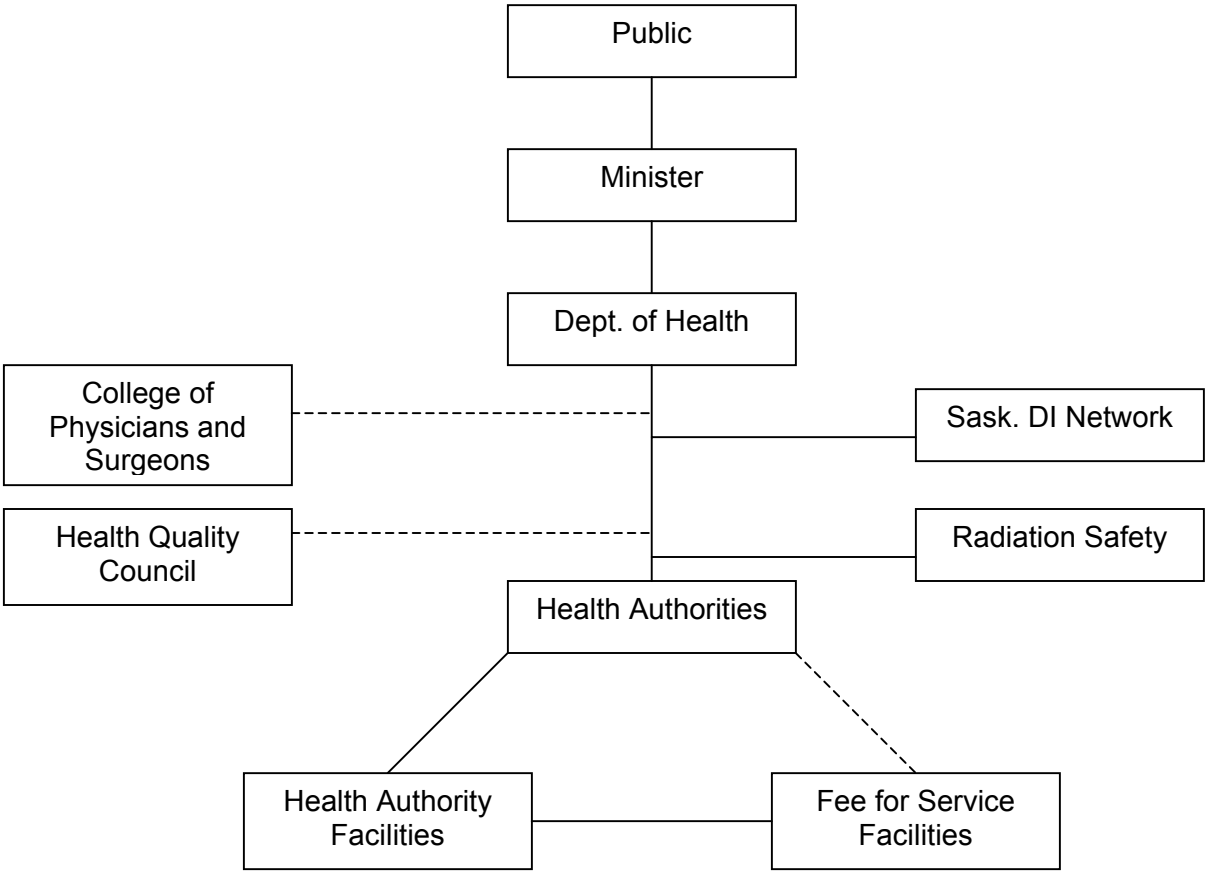
Four distinct organizational models are presented as options for organizing DI services in the province. The options build upon the strengths within the province and provide for improvements in planning, coordination and a better approach to delivery and coordination amongst the partners. With one exception (Option 4 – Status Quo) all of the options put forward here take a systems approach to the organization, financing and

delivery of DI Services. Primary in this approach is to consider the population of the Provinces as a combined population of approximately one million rather than 12 distinct population groups. This perspective recognizes the human resource, financial and technological imperatives shaping the future of DI.

3.1.3.1. Model 1- Saskatchewan DI Network

Option 1 provides for a provincial advisory body reporting to the Department of Health to assist in province-wide strategic planning and system coordination.

SASKATCHEWAN DI NETWORK



Composition of Provincial Committee

The Committee would be composed of 12 - 15 representatives appointed by Department of Health, regional health authorities and College of Physicians and Surgeons. The group should provide a mix of urban/regional/community/northern representatives and include administration, radiologists, nuclear medicine specialists, other specialists and a family physician.

Role of DI Network

- Monitor system development, implementation and performance
- In conjunction with HQC and professional bodies, establish Service/Practice Standards-desired and achievable level of performance of a service against which actual performance can be compared and ensures appropriate information to consumers on appropriate use of DI procedures is disseminated
- Ensure client satisfaction levels are measured and regularly monitored and appropriate reported
- Report on wait times, including electronically to the public
- Monitor cost inputs, both direct and indirect, compare to best practice guidelines (including other provincial and national jurisdictions) and recommend targets for the services
- Recommend service levels for geographical areas with due consideration to community and hospital based services
- Ensure a province-wide plan for HR requirements is developed and regularly updated
- Develop a province-wide plan for assessing, procuring and deploying new equipment and technologies and maintenance of equipment
- Ensure a province-wide plan for maintenance of equipment is in place
- Develop a province-wide plan for PACS/RIS, including implementation and evaluation
- Receive and review strategic plans for DI from health authorities and private clinics and make recommendations to ensure they are consistent with system-wide goals and strategies and promote integration at the regional level
- Receive and review reports on appropriateness standards of service from professional bodies and HQC and recommend effective implementation strategies and recommend ways to further align incentives with appropriate utilization
- Identify areas requiring research and support HQC in conducting research and assist HQC in knowledge transfer
- Supports provincial group purchasing practices within the public sector and provide opportunity for private clinics to participate in the program(s)
- Providing the infrastructure to realize the pedagogical requirements of the University while preserving sufficient time and energy to allow investment in the realization of the future of radiology as medicine evolves into a future driven by the understanding afforded by molecular biology and genomics.

Strengths

- The future of imaging based on computed imaging and computer-aided diagnosis provides an impetus to networking which is technology-driven
- Builds on theme of shared responsibilities for planning and coordination of services while delineating accountability of components within the provincial system
- Brings key cross-section of stakeholders together in a forum to formulate system-wide planning and coordination
- Clarifies roles in areas of management and governance between Department of Health and its partners
- Supports the roles of College and HQC with respect to quality improvement
- Supports system-wide planning for equipment and achievement of standardized group purchase practices
- Promotes integration
- Requires no change from existing structures.

Weaknesses

- May be seen as infringement on the autonomy to of existing organizations/stakeholders
- Will require funding to support the Network.

Enablers

- Clear requirements for various hospital classifications throughout the province
- Size of combined population of RHAs
- Leadership of College of Physicians and Surgeons of Saskatchewan and HQC.

Constraints

- Competition amongst RHAs for resources
- Large number of FFS clinics in some RHAs
- Absence of a province-wide PACS.

3.1.3.2. Model 2 - Provincially Managed DI

Option 2 provides for the creation of a quasi-independent province-wide corporate structure, which assumes full governance and management responsibilities for all DI services in the public sector. This option is similar to the Diagnostic Services of Manitoba Inc., which governs and manages all public laboratories and diagnostic services other than those services provided by Winnipeg and Brandon. The province determines the level of funding that is deemed appropriate for this component of the health system and the corporation manages all aspects of service already within this financial framework.

Corporate Structure

The organization is incorporated under the Non-Profit Corporations Act. Members of the corporation are appointees of the Department of Health and RHAs.

Role

- Plan, organize and deliver DI services within the public sector In conjunction with HQC, establish Service/Practice Standards-Desired and achievable level of performance of a service against which actual performance can be compared and ensure appropriate information to consumers on appropriate use of DI procedures is disseminated
- Monitor system development, implementation and performance
- Report on wait times, including electronically to the public
- Establish method to measure and monitor levels of client satisfaction
- Monitor cost inputs, both direct and indirect, compare to best practice guidelines (including other provincial and national jurisdictions) and recommend targets for the services
- Establish service levels for health authorities
- Develop a province-wide plan for HR requirements
- Develop a province-wide plan for assessing, procuring and deploying new equipment and technologies and maintenance of equipment
- Develop a plan for PACS/RIS, implement and monitor
- Establish one year and three year strategic plans for DI in the public sector
- Support the College of Physicians and Surgeons of Saskatchewan, HQC, and Regional health Authorities in the development of appropriateness criteria, their usage, and recommend ways to align incentives with appropriate utilization
- Identify areas requiring research and support HQC in conducting research and assist HQC in knowledge transfer
- Providing the degree the infrastructure to realize the pedagogical requirements of the University while preserving sufficient time and energy to allow investment in the realization of the future of radiology as medicine evolves into a future driven by the understanding afforded by molecular biology and genomics.

Strengths

- Centralized authority ensures consistency in service delivery
- Assists in the efficient assessment, acquisition through bulk purchases, deployment and maintenance of technology and equipment
- Promotes competition amongst RHAs for delivery of DI and may encourage cross-regional delivery.

Weaknesses

- Will be seen as a usurping the roles of regional health authorities

- May result in lack of integration of DI with other programs and services within regional programs and services
- This model isolates in some degree the private practice of radiology from its academic roots. Any high technology business should, for its viability, be investing in research and development to secure its future. This is no less a requirement for radiology.

Enablers

- Clear requirements for various hospital classifications throughout the province
- Size of combined population of RHAs
- Leadership of College of Physicians and Surgeons of Saskatchewan and HQC.

Constraints

- Requires additional resources for establishing and maintaining the corporation
- Absence of province wide PACS.

3.1.3.3 Model 3 - Saskatchewan Shared Services Network

Option 3 provides for the creation of a shared services network, which receives funding for all DI services in the province. In this model the RHAs come together to govern and manage DI services in a fully integrated manner.

Corporate Structure

The shared services network is incorporated under the Non-Profit Corporation Act by the RHAs. Membership may include representation from the Department of Health, either voting or non-voting.

Role

- Monitor system development, implementation and performance
- Contract with private DI clinics with agreed upon service levels
- In conjunction with HQC, establish Service/Practice Standards-Desired and achievable level of performance of a service against which actual performance can be compared and ensure appropriate information to consumers on appropriate use of DI procedures is disseminated
- Establish method to measure and monitor levels of client satisfaction
- Report on wait times, including electronically to the public
- Monitor cost inputs, both direct and indirect, compare to best practice guidelines (including other provincial and national jurisdictions) and recommend targets for the services
- Establish service levels for geographical areas
- Develop a province-wide plan for HR requirements

- Develop a province-wide plan for assessing, procuring and deploying new equipment and technologies and maintenance of equipment
- Develop a plan for PACS/RIS, implement and monitor
- Receive and review one year and three year strategic plans for DI from health authorities and make recommendation to the Department of Health. The plan is to include services provided by private clinics and how this is integrated with the public providers
- Support the College of Physicians and Surgeons of Saskatchewan, HQC, and Regional health Authorities in the development of appropriateness criteria, their usage, and recommend ways to align incentives with appropriate utilization
- Identify areas requiring research and support HQC in conducting research and assist HQC in knowledge transfer
- Establishes provincial purchasing and maintenance of equipment
- Providing the infrastructure to realize the pedagogical requirements of the University while preserving sufficient time and energy to allow investment in the realization of the future of radiology as medicine evolves into a future driven by the understanding afforded by molecular biology and genomics.

Strengths

- RHAs have clear accountability for establishing and maintaining a provincial network
- Promotes province-wide planning
- Provides a framework for RHAs to strategically share resources
- Supports system-wide planning for equipment and achievement of standardized group purchase practices.
- Promotes integration
- Supports the roles of College and HQC with respect to quality improvement.

Weaknesses

- Requires creation of new structure with associated costs
- May be seen as an infringement of the autonomy of private clinics.

Enablers

- Clear requirements for various hospital classifications throughout the province
- Size of combined population of RHAs
- Leadership of College of Physicians and Surgeons of Saskatchewan and HQC.

Constraints

- Competition amongst RHAs for resources
- Large number of private clinics in some RHAs
- Province-wide PACS/RIS.

3.1.3.4 Model 4 – Status Quo

Option 4 provides for the status quo organizational model. This model is characterized by Sask Health funding RHAs for pre-determined levels of service at a fixed cost combined with fee-for-service private clinics operating largely within a private practice milieu.

Strengths

- Organizational structures in place
- Permits province-wide planning within the public sector
- Permits province-wide evaluation of technology, acquisition and deployment of resources within the public sector
- Model supported by large segment of radiology community
- Provides for centralized decision-making of scarce resources in the public sector.

Weaknesses

- No shared responsibility amongst Sask Health, RHAs and providers for planning and coordination of services
- Does not encourage integration of services amongst all providers
- Promotes independence amongst RHAs and does not encourage cooperation amongst all providers in a geographical area
- Promotes increased service levels in more densely populated areas of the province
- Promotes unfair competition between RHAs and private clinics for human resources, both professional and public
- Provides greater financial rewards for fee-for-service interpretation and reporting rather than academics, research and administrative leadership
- Inadequate incentives for effective demand management initiatives
- A failure to provide the best possible environment for the academic mandate.

Enablers

- Clear requirements for various hospital classifications
- Provincial electronic health record
- Role of College and HQC in areas of quality
- Standardized appropriateness criteria.

Constraints

- Lack of ability to manage escalating costs and demand for services
- Does not provide adequate incentives for all providers to champion PACS/RIS
- Competition amongst RHAs and lack of incentives to share services amongst them
- Large number of FFS clinics in some RHAs.

3.1.4 Aligning Incentives

The current organization, financing and delivery of DI services is encumbered with a variety of incentives that contributes to:

- Inappropriate utilization
- Expansion of FFS clinics without coordination of services with public services
- Unfair competition for technological resources, particularly sonographers, given collective agreement which applies to the public sector and not the FFS sector
- Lack of the option to train technologists to perform functions that are traditionally the domain of radiologists without transgressing on the responsibilities of physicians for medical acts.
- Lack of incentives to promote introduction of RIS/PACS throughout the province and within FFS clinics
- Inadequate distribution of radiologists outside of Regina and Saskatoon resulting in patients travelling to the two largest centers for services and regional centers unable to attract and retain an adequate supply
- Lack of coordination between and amongst RHAs and with FFS centres
- Opportunity for greater compensation in interpretation tests than administrative leadership, research and academics for professionals
- Procedures performed in the hospital setting that could be delivered in the community
- Slow response to shifting from one modality to another
- Slow response to shifting from more surgically intensive procedure to less costly and less invasive image-guided procedure
- Long wait times for some procedures such as CT and MRI
- Unnecessary travel by rural residents for some DI procedures
- Inadequate supply of radiologists/NM professionals and technologists in the province and demonstrated difficulty in recruiting.

Re-aligning incentives will allow RHAs, and their medical staffs, to respond in a more timely manner to changing HR requirements resulting from changes in technology and best practices, such as:

- Competitive professional and technologist compensation within the province and with other jurisdictions
- Re-training technologists from one modality to another
- Substituting surgical procedures with DI procedures where appropriate in the future
- Increasing emphasis on academic, research and medical leadership
- Better coordination of community and hospital-based clinical services.

Re-aligning incentives will require leadership from Sask Health and RHAs (including their medical staffs) at the provincial level. This is required in the following areas:

- Reporting to the public on wait times and informing them on ways in which they can more effectively and efficiently access the system
- Establishing and monitoring short-term and long-term strategies for the provincial system

- Recommend changes in financial incentives to achieve system-wide goals and objectives
- Support the College and HQC in establishing quality improvement standards and appropriateness criteria for DI procedures
- Establishing a provincial wait-list for CT and MRI
- Serving as a support and link to the Sask Health Human Resource Planning Division.

Re-aligning incentives will assist in achieving system-wide goals and objectives with professional leadership of the College and HQC in the following areas:

- DAP for all DI modalities, regardless of location of the equipment
- Establishment of quality improvement requirements, including quality best practices and appropriateness criteria
- Establishing standards for timely reporting on results of procedures.

The Diagnostic Imaging Steering Committee considered the four organizational models cited above and unanimously agreed (by secret ballot) that model 1 – Saskatchewan DI Network is the most appropriate models for Saskatchewan at this time.

3.1.5 Recommendations

THE FOLLOWING IS RECOMMENDED:

1. SASKATCHEWAN DI IMAGING NETWORK BE IMPLEMENTED AS THE PREFERRED OPTION OF THE STEERING COMMITTEE (MODEL #1)

2. COMMUNITY AND HOSPITAL-BASED SERVICES BE MORE COORDINATED

3.2 ACCESS AND DEMAND MANAGEMENT

Many regions report what they deem to be unacceptable wait times (access to machine, referral process, distance, etc) for specific DI services; in some cases these are longer than wait times reported in other provinces. Acknowledging the realities imposed upon the delivery of health care in this era, suggestions were made to improve service delivery, not simply to add more services.

3.2.1 Issues

During the course of the review it was noted that there is a need to:

- provide a provincial-wide approach to delivery of care
- implement a central registry for provincial patients and booking systems
- ensure equal access on the basis of clinical priority, between referrals from clinics, WCB and other agencies
- provide adequate IT, to enhance the delivery of care
- provide tools to eliminate inefficient work processes that negatively impact access and use limited resources poorly
- provide appropriateness guidelines to ensure the right exam is done for the right patient for the right reason
- implement a DM strategy.

In many cases it was also noted that patients must travel to health regions other than their own to access the DI services. A significant number of patients are also going to private DI facilities outside the province. These private facilities attract Saskatchewan's expertise as well as its patients away from the province.

During the course of the review it was noted that there is a need to:

- develop a province-wide strategic plan that provides better access to DI;
- strategically position services to address the clinical requirements and geography of the province;
- equalize access to imaging systems by addressing geographic and specialist /GP referral access, as well as wait time issues;
- implement technical solutions to improve physician service coverage due to geography and manpower shortages;
- implement systems that enable care providers to fully understand demand requirements and match these with resources; and
- improve the ability to identify where FFS and special procedure (MSB-insured) exams are performed.

3.2.2 Literature

The term "demand management" (DM) is the process of managing consumer demand for services. In health care, this refers primarily to the demands of patients, but can also refer to the demands of providers acting on behalf of patients. Much of the literature on DM originates from the United States of America (USA) and is closely tied to cost

containment and managed care. However, the ultimate goal of DM is to maximize health through patient empowerment.
The term was first applied to health care by Vickery and Lynch in 1995. They defined it as a group of support systems to enable and encourage consumers to use medical care appropriately.[1] Other authors have provided their own views, for example: "the process of getting people the care they need, when they need it, in a way that leaves them satisfied with their health care encounter",[2] and the "package of programs and processes designed to improve health and encourage appropriate use of medical services for consumers and patients...compared to all other health care strategies, the most patient-centred tool."[3]

Experts point out that traditional management of the health care system focuses on controlling resources through management of supply. This inevitably means management of access. DM is seen as the opposite; it controls demand, ideally through optimal health care decisions, generally arising from education of patients.[4,5] Demand reduction "does not imply the withholding of treatment or a decrease in access [but] rather it indicates that the informed consumer is best served by selective, thoughtful requests for medical services".[6]

General Strategies

Some examples of DM strategies are: telephone advice lines; prevention and wellness programs; chronic disease self-management programs; targeted programs to modify health risks for individuals; and educational materials such as brochures, posters, videos, self-care manuals, and web sites. Note: those concerned about assuring an evidence-base for innovations point out the need for all such initiatives to be assessed for effectiveness prior to widespread (and perhaps blind) acceptance.[7]

One author suggests a stepped approach to implementing DM from a primary care perspective (adapted from Goldberg).[2] This could perhaps be refined for other settings.

1. Be sure inceptives are aligned, i.e., is there a financial incentive to manage demand?
2. Forecast demand for services, i.e., forecasting demand must precede its management.
3. Identify a target population i.e., which patients/providers should be targeted?
4. Define appropriate use of medical resources.
5. Identify barriers to appropriate utilization.
6. Use the tools of the trade, i.e., what is already available / what are the options?
7. Assess the resources available and decide whether to buy or build.
8. Plan for an evaluation of initiatives implemented.
9. Design a SMART program (specific, measurable, aligned with incentives, realistic, time-limited).

DM Strategies in DI

Most published material addresses managing the demand placed on the primary care system by patients. However, in Canada, both patients and providers, on behalf of their patients, place tremendous demand (expressed as wait lists) on secondary and tertiary

providers and services. DI falls into the latter category, particularly with respect to technologies such as MRI scanners. How can this demand be managed?

A search of published and unpublished literature revealed the following:

- Wait list management, including prioritization of patients: The Western Canada Waiting List Project (WCWL; www.wlwc.org) has developed scoring tools for priority setting for five different interventions, one being MRI,[8] to provide a "standardized, reliable means of assigning priority for services".
- Data collection to facilitate planning: The Institute for Clinical Evaluative Science (ICES) observed that optimal evidence-based planning for MRI services is not possible (in 2003) due to lack of necessary data such as reason for referral. They suggested a "centrally managed, standardized data collection tool to be used at all MRI centres."[9]
- Guidelines for physician referral, to optimize appropriateness: Guidelines are based on evidence, consensus or Delphian methods, or a mix. Guidelines for DI have been developed by academic groups,[xxix] governments, hospitals, and professional organizations, for example the American College of Radiologists in the US and the Royal College of Radiology in the UK.[xxx] The CAR plans to publish guidelines late in 2004.[10] Note: use of guidelines may increase utilization if numbers of appropriate cases are not being investigated at present.
- Determination of "appropriate" referral rates for specific DI procedures can provide benchmarks for appropriateness; this has been done by some groups.[11]
- GP versus specialist: For some sophisticated technologies, jurisdictions vary in their policies of acceptance of referrals from all physicians versus only from specialists. It is not clear whether this type of policy changes rates of utilization and access but regardless, evidence should be used to support referral protocols.
- Radiology scheduling systems: Non-emergent DI exams are generally booked using appointment systems – either mail, phone, or electronic. Each system has advantages and disadvantages and limitations to access may occur if an inefficient system is employed.[11,12] One potential advantage to electronic ordering is the ability to imbed guidelines within the order entry system, to ensure appropriate referrals.

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3.2.3 Aligning Demand Management Incentives

Currently, there are minimal incentives in place to promote the introduction of demand management initiatives in both the public and private sectors. Those used to date have been in the form of utilization management practices in the RHAs and in the voluntary adherence by some practitioners to adopt appropriateness criteria such as the Ottawa Guidelines. However, incentives to promote such activities are primarily limited to the desire of professionals and RHAs to support continuous quality improvement practices. The lack of incentives to apply such initiatives in DI, combined with inadequate information systems, has resulted in limited applications of such tools in the province and elsewhere in Canada. To be effective, financial incentives and accountability must be the cornerstone of a demand management strategy. Clear financial incentives should be paid to all providers to achieve best practices in this area.

Effectively re-aligning incentives will place a greater responsibility on RHAs and medical staffs to champion best practices. It will require RHAs to assume a greater level of delegated authority that will allow them and their medical staffs to integrate DI services within their geographical area and to deliver them in accord with Sask Health's overall strategy. This will require RHAs, and their medical staffs, to effectively introduce and monitor further demand management strategies.

This will include:

- Development of a clear definition of demand management and goals and objectives
- Determine the primary focus groups in populations and referring physicians
- Establish financial incentives for stakeholders for successful implementation such as rewarding RHAs for achieving improvements in best practices thus placing primary responsibility on RHAs for effective demand management initiatives
- Develop educational tools for specific target groups

- Continued support and active participation in the Western Canada Waiting List Project and related activities of the Canada Health Council
- Identify barriers to appropriate utilization
- Centrally managed standardized data collection tools used with all MRI centers
- Establishment of a common referral criteria for specialists and GPs
- Aligning policies and procedure manuals for a common approach
- Develop common procedure protocols for MRI and CT using the tertiary centres as a guide
- Implementation and use of appropriateness criteria
- Reporting on wait times on a provincial basis
- Province-wide wait-list for CT, MRI, US and NM
- Province-wide scheduling system for non-emergent CT, MRI, US and NM with electronic ordering utilizing embedded appropriateness guidelines.

3.2.4 RECOMMENDATIONS

THE FOLLOWING ARE RECOMMENDED:

3. KEY INDICATORS OF SYSTEM PERFORMANCE BE IDENTIFIED

4. WAITING LISTS BE MONITORED PROVINCIALLY

5. SHARED PROTOCOLS BE DEVELOPED

6. APPROPRIATNESS GUIDELINES BE REVIEWED, WHERE APPROPRIATE ADOPTED AND THEIR USE AUDITED

3.3 HUMAN RESOURCES

3.3.1 ISSUES

Most regions expressed concern about maintaining their levels of adequately trained personnel. Technical staff is being drawn to other provinces and to FFS facilities reportedly due to better pay and benefit incentives. Many existing staff members are expected to retire in the next few years, exacerbating this shortage. Regions with limited services find it very difficult when they need to recruit technical staff on a part-time or locum basis. Sonographers in particular, seem to be in short supply, as there is no longer a training program in Saskatchewan. Different health regions have managed staffing concerns in various ways: one region trains its own support personnel; another region offers bursaries for technical training, with a return-of-service requirement; and a third region uses radiologists who travel from South Africa in one to three month rotations.

When represented as a percentage of total physicians, there are fewer radiologists in Saskatchewan than in other Canadian provinces. Regional centres have a difficult time in attracting radiologists, especially if they need to hire a second radiologist into a position that is less than full-time. Many radiologists report that they work long hours and then provide on-call services, leaving little time for a personal life. Radiologists in the urban centres are concerned that when services such as CT increase in regional facilities, they will be required to provide more technical support. There are also reports that other provinces are vying for interpretation service agreements in Saskatchewan's health regions. Facilities outside the province are already attracting Saskatchewan patients for DI services. If interpretation services also transferred outside the province, then this would further jeopardize the development of the province's DI system as a whole, including a comprehensive HR strategy, DI costs (if the costs are not competitive) and last but not least, staff morale.

Some regions have formally delegated functions related to specific procedures to technologists (image interpretation is an exception) – an initiative that is successful but occurring on a small scale. There may be a limit as to how extensive this delegation can be. Also radiologists are unsure as to whether this is in their best interest.

During the course of the review it was noted that there is a need for:

Overall

- including caregivers in strategic planning ;
- HR strategic planning for radiologists, technologists, clerical support, and service (IT/biomedical) manpower requirements;
- incentives for recruitment and retention, particularly for hospital-based interventional work, academic work, and consultation services;
- education planning and career planning opportunities;
- consistent wage rates in comparison to other provinces; and
- initiatives to raise morale and eliminate staff burnout.

Technical Staff

- initiatives to address shortages of radiology and sonography technologists;
- standardized pay rates for technologists doing identical jobs;
- reductions / eliminations of non-technical work being done by technologists;
- development of technical assistant roles for non-technical and technical work;

- development of common policies, procedures, and guidelines among RHAs;
- increases in cross-coverage capabilities among hospitals and RHAs;
- re-engineering of work processes with implementation of RIS/PACS;
- modifications of manpower planning for a new RIS/PACS paradigm;
- provision of support for " expanded-role " requirements that change the scope of work of technologists; and
- planning for a province-wide preventative service program, building upon existing manpower.

Clerical Staff

- re-engineering of work processes with implementation of RIS/ PACS; and
- modifications of manpower planning for a new RIS/PACS paradigm.

Radiologists / Nuclear Medicine Physicians

- initiatives to address shortages of radiologists and nuclear medicine physicians to meet current and future clinical requirements;
- development of a strategic plan to attract and to retain radiologists and nuclear medicine physicians;
- integration of care delivery (radiology, nuclear medicine, cardiology, etc.), where possible;
- positive initiatives to address the issue of non-certified radiologists;
- initiatives to address inconsistent referral standards for other physicians;
- provision of a focused strategic resource plan including retention, recruitment, and change management,
- development of common policies, procedures, and guidelines among RHAs;
- encouragement of cross-coverage among hospitals and RHAs;
- implementation of solutions that address inconsistent reimbursement;
- implementation of solutions to address inappropriate DI use; and
- initiatives to address perverse (opposite of what is right-direction) incentives associated with FFS remuneration.

3.3.2 HUMAN RESOURCE LITERATURE

Background / Types of Professionals

It takes many types of people to operate a DI department; all have essential roles to play. For the purposes of this review, the professions considered include: radiologists (including nuclear medicine physicians),[xxxi] medical radiation technologists (MRTs),[xxxii] sonographers (ultrasound technologists), and medical physicists. The mix and the duties of different professions vary depending on the community, with more complex staffing typically seen in tertiary / academic centres. Scopes of practice are also evolving. Subspecialization has occurred as well, e.g. for radiologists, the introduction of a number of interventional procedures means that some radiologists are occupied full-

[xxxi] The Royal College of Physicians and Surgeons of Canada recognizes nuclear medicine as a unique specialty. However, nuclear medicine images are currently interpreted by both radiologists and non-radiologists (e.g., cardiologists), depending on the jurisdiction.

[xxxii] MRTs are specialized in: magnetic resonance, nuclear medicine, radiological technology, and radiation therapy.

time as interventional radiologists, and some work only within a particular clinical area, e.g., interventional neuroradiology.[1]

The Issues

A number of issues are common to professions: e.g. manpower supply (including workforce aging), advances in technology, and changing educational programs and requirements.[2] Foremost among these concerns is that of manpower supply. Using data from the Southam Medical Database, CIHI reported the following radiology professionals in Canada in 2001 (approximate numbers): 1900 radiologists, 200 nuclear medicine physicians, 14,700 MRTs, 2500 sonographers, and 300 medical physicists.[2] For radiologists, data reported by CIHI was consistent with data from the CMA Masterfile which recorded 1872 certified diagnostic radiologists in Canada in January 2000.[3]

(A) Physicians

Several sources report that there is a shortage of radiologists are in short supply worldwide, e.g. in Canada,[3] the UK,[4] the USA,[5] Australia,[6] South Africa,[7] and Scandinavia.[7] This is true for nuclear medicine physicians as well.[8] In Canada, the CAR has projected radiologist supply extending to 2021 and, taking account of the numbers of radiologists completing their postgraduate training, movement abroad and back, retirement, and death, has projected a decrease in the radiologist workforce (per capita) until 2010, and then stabilization in numbers.[3] The CAR also projects increasing demand per capita based on population aging, new technology and indications, and "relative value" (examinations becoming more complex and time-consuming).

In the USA, Dr. Jonathan Sunshine and colleagues track radiologist manpower issues and monitor trends using surveys, medical journal employment ads, professional society placement service data, retirement rates, and workload/productivity. There is concern that demand and workload are increasing more quickly than are the numbers of radiologists. However, they have recently noted a slowing in the shortages and plan to study this further.[9] The USA also uses "physician extenders", such as physician assistants (PAs), and this profession is being considered as an adjunct to radiologists, particularly in the area of interventional radiology.[10]
In Canada, we know there has been a decline in overall physician supply; although numbers of physicians are increasing, per capita supply is decreasing.[11] Why? Apparently the demands of an aging patient population are increasing; there are more female physicians who traditionally work fewer hours; the length of training requirements increased in the 1990s leading to fewer postgraduates entering practice from 1994 to 2000; fewer international medical graduates have entered Canada; the physician retirement rate is increasing; there was a 10% cut in medical school positions in 1993; and net migration abroad has increased slightly.[11,12] None of these factors are simple and the data can be inconsistent. For example, research conducted by the Canadian Health Services Research Foundation asserts that the "brain drain" of physicians exiting from Canada is a trend that has now reversed.[13]

(B) Technologists and Sonographers

Manpower shortages are an issue for MRTs and sonographers as well. These shortages are significant across Canada, Saskatchewan included.[14] The 2003 Annual Report of the Canadian Association of Medical Radiation Technologists (CAMRT)

identifies manpower shortages as a significant issue, attributed to lack of funded educational positions, aging of the workforce, and technology expansion.[15] Increasing numbers of MRTs have been certified over the past five years: 421 in 1999 versus 603 in 2003 (including 13% international graduates).[15] However, programs are still producing fewer technologists than what is required in the marketplace. The actual number of MRTs has remained static over the past 10 years, meaning the number of MRTs per 100,000 population has dropped: in 1993 there were 49.9 MRTs/100,000 versus 47.1/100,000 in 2002.[15]

One author from the USA attributes shortages to decreasing morale, perceived inadequacy of compensation, a decreasing number of training programs, and limitations in the career ladder.[16] A 2002 Health Canada study also reports low morale attributed to budget pressures and cut-backs, increasing patient flow, job insecurity, increased physical demands, lack of leadership, and limited career opportunities.[17]

The CAMRT advocates an expanded role for MRTs in assuming some procedures now carried out by radiologists, and is working with the CAR in this regard.[14] In the USA and the UK this redefinition of scope of practice is formalized in the profession called a "radiologist assistant (RA)".[18] The ACR, concerned about radiologist shortages, has now approved roles and responsibilities for this profession.[19] Also, at the 2003 meeting of the Radiological Society of North America, details about scope of practice, education, training, and certification were presented.[20] At another level, authors from the USA reported on their successful experience training "technology aides" to assume some of the duties of MRTs to improve retention of staff and employee satisfaction and to reduce turnover.[21]

(C) Medical Physicists

Medical physicists may work at a university, medical centre, cancer centre, independent or private hospital or clinic, or in industry. This group of 250-300 professionals is the smallest under consideration; however, shortages exist in this field as well. According to the University of Alberta Medical Physics Division web site, in July 2000 there were 41 vacancies out of 178 positions in Canada.[22] The same source states that the rate of manpower needs in medical physics will be greater than the expected increase in patient population due to the increasing complexity of the equipment used.

Innovative ideas from the literature

1. Increases in remote reading / teleradiology
2. Use of speech recognition rather than manual transcription (enhanced workflow)
3. Expansion of the role of MRTs to assume some tasks of radiologists
4. Introduction of technology aides to assume some tasks of MRTs
5. Initiatives to focus on and enhance employee retention
6. Computer-aided / computer-effected interpretation
7. Robotic interventionalists
8. Smart workstations.

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3.3.3 ALIGNING INCENTIVES

Sask Health is commended for creating the Health Human Resource Planning to provide for overall planning of human resources in health care in the future. A provincial advisory committee on DI will allow this division to work in synergy with RHAs and DI professionals.

Developing a strategic plan with an appropriate mix of human resources to address Saskatchewan's current and future changing demographic, geographic, clinical and academic requirements is essential. The following are recommended:

- Establish a DINet sub-committee to focus on human resource requirements for the province of Saskatchewan;
- Develop an in-depth database of radiology's and nuclear medicine's medical and technical professionals in the province and their current demographics;
- Create an inventory of their academic and technical qualifications and related work experience in order to establish an "as is" situation;
- Identify potential changes to the delivery of care based on the Province's preferred DI service delivery model, the impact of new imaging and informatics technologies and the resulting work-flow reengineering requirements;
- Determine future human resource requirements based on the changing environment and identify the "gap requirements" to meet both immediate and future needs;
- Identify physician-extender and technical-extender (expanded role) opportunities by working with the professional associations (CAR, SAMRT, CSNM, CANM, SADMS) and Sask Health human resource department to identify where delegation of authority is practical and attainable within the province;
- Establish new technical and physician workload standards for the delivery of care by various professionals based on the current and future models;
- Determine the incremental academic requirements and where/how these education and training requirements will be addressed in the development of these new roles;
- Assess existing reimbursement of these professionals in relation to the preferred delivery model and implement changes which support the change management, retainment, and recruitment of professionals that augment existing human resource requirements;
- Implement incentives that enhance the current environment and encourage retainment and recruitment of medical and technical resources;
- Implement technologist-extender requirements initially to "free-up" resources to take on other technical-related requirements (MRI, CT, RIS/PACS, others) and physician-extender requirements;
- Implement physician-extender requirements to "free-up" professional resources to address existing "gap requirements" and new requirements based on the new model;
- Monitor and report progress to the Provincial Advisory Committee (DINet);
- Review, re-assess and re-adjust based on an ongoing changing environment.

3.3.4. Recommendations

THE FOLLOWING ARE RECOMMENDED:

7. A HUMAN RESOURCE STRATEGY FOR THE PROVINCE IN THE CONTEXT OF DI BE DEVELOPED

8. OPPORTUNITIES FOR AN EXPANDED ROLE FOR TECHNOLOGISTS BE EXPLORED PROVINCIALLY

3.4 CONSULTATION AND APPROPRIATENESS

3.4.1 Consultation Reporting Issues

Physicians providing DI services felt strongly that all films must be interpreted by qualified radiologists. However, it is difficult to do so throughout the province in a timely and consistent manner. The value of a province-wide RIS/PACS is strongly supported in order to better serve programs in rural areas. Physicians expressed a belief that a PACS would save staff time and improve quality of work life.

During the course of the review it was noted that there is a need to:

- review whether all images need be reported;
- provide necessary DI technologies (RIS/PACS);
- provide consistent and efficient dictation systems;
- address inconsistent response times due to problems with manpower, technology, and policies; and
- benchmark and audit report turn-around times.

3.4.2 Appropriateness / Clinical Guidelines Issues

The radiologists report that some evidence-based practice guidelines are currently being used to guide practice, but there are mixed feelings about their success. The radiologists believe that stringent use of clinical guidelines could reduce inappropriate utilization, especially with regard to plain film radiographs.

Even though radiologists review requisitions and “triage” cases, they do not see themselves as “gatekeepers” of the system and do not wish to take on this role, especially with respect to referring physicians who can be resourceful in getting around guidelines. Radiologists report that some referring physicians practice defensive medicine by ordering more tests than may be clinically indicated, rather than relying upon their clinical judgment.

During the course of the review it was noted that there is a need to:

- develop/implement clinical guidelines, and audit their use
- develop common prioritization methodology based on clinical requirements
- ensure patients go to the “most appropriate technology”.

3.4.3 Procedure Manual Issues

DI managers and front-line staff note that each facility has their own examination procedure manual which contributes to inconsistent delivery of DI services and contributes to repeat CT, MRI and other procedures based on personal preferences. A common procedures manual allowing for personal variations manual as well as common protocols would help to facilitate a higher quality of care to patients throughout the province.

During the course of the review it was noted that there is a need to:

- develop a common Procedure Manual utilized on a provincial basis
- develop consistent protocols in CT, MRI, avoiding requiring repeat exams.

3.4.4 Literature

Preamble

The focus of this section was originally to be on models of provision of DI services in Canada and internationally, including a discussion of the pros and cons of various models. Financial aspects were envisioned as a driving force for discussion, e.g., whether imaging is a cost centre where everything is seen as an expense by administration, or whether it can serve as a revenue-generating centre for a hospital or health authority. Government control versus free enterprise is another key consideration, particularly with the USA next door. Hospital settings versus clinic settings, and academic positions versus non-academic positions were of interest. Unfortunately, the available literature does not adequately address all aspects of these areas; perhaps much of the relevant information in this area has not been made public. Possibly, relevant literature will be forthcoming with the various health care reform initiatives underway in Canada. However, some references were located which discussed aspects of practice models, as presented below.

Practice Models in the USA

In a survey of its members in 1995, the ACR determined that 90% of radiology groups in the USA have at least part of their practices in hospital. According to the 2002 ACR document,[1] possible practice settings include one hospital or several, private radiology offices, and outside imaging centres. The variety of practice settings means a number of different practice models are in place, including: exclusive contract (sole provider), non-exclusive contract (several groups sharing), hospital employee, affiliation through a professional corporation (which could be multi-specialty), affiliation via hospital privileges with no contract, joint ventures with hospitals in the ownership and operating of external facilities, on-call provision only, medical direction and administration only, or various hybrid models of these. The ACR document concludes by noting that most hospitals favour exclusive contracts with radiologists to ensure accountability and on-call coverage.

Establishment of a radiology facility

As complex operations, radiology facilities should be set up and managed to function smoothly and efficiently. Leepson[2] points out that, in particular, sufficient time and energy must be devoted to strategic planning, with strategies focussing on clinical and quality issues, governance and administration, technology, and relationships. In particular, areas worthy of attention are listed as: (1) imaging and communication technology, (2) finances and reimbursement, (3) ownership structure of imaging entities, and (4) critical workforce shortages. In general, practice models are closely linked to funding and remuneration.

Professional Roles

Not all "radiology exams" are performed by radiologists, for example coronary angiography may be performed by cardiologists, and ultrasounds examinations may be performed by emergency physicians and obstetricians. It is not clear in whose hands these examinations are best performed. In 1989[3] the ACR found that 25% of all radiology work in the USA was being performed by non-radiologists: 46% in offices and freestanding centers, 27% for hospital inpatients, and 8% for outpatients. The medical specialists involved were cardiologists, internists, orthopaedic surgeons, ophthalmologists, and GPs, and the most common procedures were ultrasound, interventional radiology/angiography, and general radiology. The ACR expressed concern that this may drive utilization and costs and decrease quality, however this could be seen as professional bias coming from a special-interest group.

The organization pursued this further by examining whether a set of guidelines limiting imaging privileges could decrease costs without affecting quality in a health maintenance organization;[4] numbers of examinations were counted pre-guidelines (1995) and post-guidelines (1997). Results showed a decrease of 20-25% in exams performed when guidelines were introduced, with the share of procedures performed by non-radiologists dropping from 39% to 15%. Quality indicators remained unchanged whereas detractors had threatened quality would suffer with such an initiative.

It is clear that, at least in the USA, turf wars exist among specialties.[5] Procedures such as angiography and Doppler ultrasound were introduced by radiology but now have been taken up by other specialties. This can lead to conflict as a result of workload and reimbursement discrepancies, this perhaps being more extreme in the USA due to managed care. One proposed solution is to have teams working together collaboratively; either teams of radiologists and medical/surgical specialists or radiologists and educated primary care physicians. Another proposed solution is for radiology to prove its value through methodologically sound research (including tracking of outcomes), high quality, and attention to the service aspects of care such as after-hours on-call provision.

There is a move to increase the responsibilities of technologists to allow them to perform duties traditionally performed by radiologists. Barriers exist, including that of remuneration. One author noted the differences between the system in North America and that in the UK. "In the UK, most radiologists are paid a salary. There is no economic disincentive [for radiologists]…in terms of working hours to devolve responsibility on a prescribed and graduated basis to suitably qualified and experienced staff."[6] Could the Canadian FFS system be a major barrier to this type of change?

Radiologist Subspecialization

Subspecialization of radiologists is increasing. In the USA, the ACR quantitated this trend through a 1995 survey of 1244 practicing radiologists. Data revealed that 28% were subspecialists and, compared to generalists, these individuals were younger and more likely to have fellowship training, work in cities, work in large groups, be employed by academic institutions, and provide a narrow range of services.[7] One conclusion of the ACR report was that subspecialization is likely to continue growing. In 1998 paediatric radiology in particular was evaluated in the USA and Canada through a survey of members of the Society for Paediatric Radiology (728 surveyed; 57% response rate).[8]

Survey results showed that most (85%) had fellowships in this area and more than half were involved in interventional procedures. However, as compared with an earlier trend to concentrate in cities, paediatric radiologists were moving to community settings.

Issues Related to Funding

In some provinces, hospitals receive radiology funding as part of their annual operational grants but funding for radiology in non-hospital facilities comes from a separate budget, leading to friction and competition for available funds. At least one policy expert in Canada believes funding for all radiology should come from a single envelope to allow province-wide life cycle management of equipment.[9]

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Continuous quality improvement is an expectation in successful and highly performing businesses. This will involve customer listening, benchmarking and analysis. It will only be possible in an environment which is not hierarchical and where there is by common consent a dedication to improved care.

3.4.5 Aligning Practice Models Incentives and Strategies

Best practice in DI is a balance amongst four key dimensions, including: affordability/ cost, customer satisfaction, health/system impact and service standards. Within the Province of Saskatchewan consideration must be given as to whether best practice or the status quo is affordable or sustainable. It is within this context that an appropriate model that meets the needs of the residents of Saskatchewan is developed.

In an effort to identify potential practice models for consideration, it was necessary to understand the existing environment relative to other jurisdictions. DI workload was requested in order to determine exam/population ratios in and utilization data by modalities (general radiology, ultrasound, nuclear medicine, CT and MRI).

In order to establish Saskatchewan RHA workload, data was collected from RHAs and Sask Health. The data below reflects audited data provided by Sask Health for '03/04

and validated by the RHAs. FFS information was requested from MSB, an upset figure of 371,083 services was provided for that same time period.

To facilitate a comparison, DI workload information was requested for 03/04 through national and international literature searches, and direct communication with Provincial, Federal and other professional organizations. Table 58 is a culmination of this data..

Table 58 Combined RHA and MSB Workload for 03/04

Table 1 - Provincial DI Utilization per Population				31,946,316	Stats Canada July 2004
Province	Procedures	Population	% of Pop of Canada	Provincial Proc/Pop.	Extrapolated to Canada Proc/Pop
NL[1]	644,358	517,027	1.62%	1.25	39,813,906
NB[1]	988,874	751,384	2.35%	1.32	42,043,591
NS[1]	1,132,698	936,960	2.93%	1.21	38,620,142
Ont [2]	9387208	12,392,721	38.79%	0.76	24,198,617
Que[5]	7,208,423	7,542,760	23.61%	0.96	30,530,278
MB[1]	838,604	1,170,268	3.66%	0.72	22,892,456
AB[4]	3,145,000	3,201,895	10.02%	0.98	31,378,657
Sask[3]	1,211,082	995,391	3.12%	1.22	38,868,754
Canada	24,556,247	27,508,406	86.11%		
Ratio of Procedures/Population		0.89			

1. CHI provided (03/04)
2. C.A.R. (00/01 data)
3. Sask 851,203Public, -11,204(Screen Mammo), plus 371,083 MSB (max for 03/04)
4. Alberta (2002) DI Project estimate.
5. Quebec Report

While Saskatchewan's utilization appears consistent with Maritime Provinces, it is substantially higher than Quebec, Ontario and Alberta and the .89:1 ratio of the provinces included in the same. However, true comparison is suspect as the provincial data represents different fiscal years, is from varied sources and there are no details regarding what is included/excluded (e.g. D.A.D. only, private, breast screening, other providers, etc). Furthermore, the data is not age standardized. While a comparison of this data may not be reasonable, CHI quotes a national utilization of 31,000, 000 annuals examinations or a 1:1 utilization ratio. In this context, Saskatchewan utilization would be substantially over the national rate.

Assessing utilization by modality, Saskatchewan's utilization is estimated as follows in table 59.

Table 59 – DI Utilization by Modality

	RHA	MSB Modified	Total	Sask
Gen Radiology	634,787	248,786	883,573	72.96%
Ultrasound	85,760	122,297	208,057	17.18%
Nuc Medicine	23,717		23,717	1.96%
CT	83,003		83,003	6.85%
MRI	12,732		12,732	1.05%
Totals	839,999	371,083	1,211,082	100.00%
		Excluded:	Screen Mammo	

Using the data above, a comparison to other jurisdictions is shown in table 60 below.

Table 60 – Utilization by Modality Comparison

	Ontario % (00/01)	Alberta (2002)	Sask (03/04)	Australia (00/01)	UK - NHS (02/03)
Gen Radiology	62.01%	71.70%	72.96%	58.95%	70.42%
Ultrasound	15.78%	16%	17.18%	27.95%	19.07%
Nuc Medicine	8.36%	5.20%	1.96%	2.40%	1.86%
CT	8.71%	4.70%	6.85%	9.00%	5.98%
MRI	5.14%	2.40%	1.05%	1.70%	2.66%
Total	100.00%	100.00%	100.00%	100.00%	100.00%

While the same caveats apply to comparison of this data, there are a number of obvious consistencies including: high use of general radiology and ultrasound and low use of CT and MRI. Global trends suggest there will be a continued decrease in the use of general radiography and fluoroscopy, and increasing use of US, CT and MRI. Both of these trends should be taken into account in defining a preferred practice model.

Effective re-alignment of practice model should include:

- Acknowledge DI services as an integrated provincial resource
- Develop of a clear definition of best practices, goals and objectives
- Establish actual utilization in comparison to other jurisdictions to benchmark and periodically compare
- Determine the primary focus areas for implementing best practice methods
- Establish incentives for stakeholders for successful implementation such as rewarding RHAs and FFS facilities for achieving best practices
- Identify barriers to appropriate utilization and practice model changes
- Improve and centrally manage standardized data collection tools used for all DI centers
- Implement an integrated information system linking RHA and FFS
- Establish a common referral criteria for specialists and GPs
- Aligning policies and procedure manuals for a common approach
- Develop common procedure protocols
- Implement and use of appropriateness criteria
- Report on wait times on a provincial basis
- Focus on collective solutions for enhanced patient care
- Develop a Province-wide wait-list for CT, MRI, US and NM
- Implement a Province-wide scheduling system for non-emergent CT, MRI, US and NM with electronic ordering utilizing embedded appropriateness guidelines.

3.4.6 Recommendations

THE FOLLOWING ARE RECOMMENDED:

9. PROVINCIAL BENCHMARKS AND QUALITY INDICATORS BE DEVELOPED AND APPLIED TO CONTINUOUS IMPROVEMENT THROUGHOUT THE SYSTEM

10. COMMON PROCEDURE MANUALS BE DEVELOPED FOR USE THROUGHOUT THE PROVINCE

3.5 MEDICAL IMAGING EQUIPMENT AND INFORMATICS

3.5.1 Medical Imaging Equipment

3.5.1.1 Issues

Providers reported that while some equipment is relatively new, much of it is nearing retirement. Old equipment has the potential to become unsafe, costs more to maintain and repair, has the potential for unplanned downtime, and may provide less than optimal images. Some claimed that, in the past, DI purchases have been non-clinically motivated, rather than being undertaken as part of a province-wide plan. Also, radiologists and DI managers warned that new equipment alone, without adequate operating funds to support its use, does not result in better patient service.

During the course of the review it was noted that there is a need to:

- develop a province-wide inventory of existing DI equipment;
- develop a strategic provincial-wide plan for the replacement, upgrading, and introduction of new technologies as well as conversion of existing technologies to a paperless and filmless model;
- develop a province-wide strategic plan for equipment maintenance;
- provide consistent and sufficient equipment funding, based on a retrospective review of existing DI technologies and a province-wide strategic plan;
- develop a strategic plan to address FFS equipment requirements; and
- eliminate the reliance on aging, unreliable, and inefficient DI technologies that negatively impact costs and patient access.

Advancements in technology are changing faster in DI than in any other area in health care delivery. This provides the industry with significant opportunity to improve clinical services, academic and research advancements and integration within the overall delivery system. However, if not managed appropriately, it will contribute to isolated approaches to delivery and wastes in resources.

3.5.1.2 Medical Imaging Equipment Background

Saskatchewan DI services are provided by both publicly-funded, hospital-based facilities and FFS clinic facilities. These services cover a comprehensive range of DI procedures which support various clinical programs. Services include general radiography, fluoroscopy, tomography, angiography, MRI, CT, mammography, screening mammography, ultrasound, nuclear medicine, and cardiac catheterization labs. These services are provided and managed by a variety of health care professionals including imaging technologists, imaging managers, nursing staff, radiologists, nuclear medicine physicians, and cardiologists. Additional physician support for specific services is provided by general practitioners, and specialists in paediatrics, internal medicine, orthopaedics, and obstetrics/gynecology.

Currently, DI services in the province of Saskatchewan is comprised of 484 imaging devices of which 380 (78.5%) are located in RHAs and a further 104 (21.5%) are located in FFS facilities.

Total replacement value of both public and FFS imaging devices is estimated at $165.0M. Of this total, public DI imaging equipment accounts for approximately $138.5M (84%) of the total replacement value, while the FFS sector accounts for the balance of $26.5M (16%).

Of the total workload for '03/04, public facilities accounted for 839,999 exams of the total of 1,211,082 services (69.3%), while FFS facilities account for the balance of 371,083 services (30.7%). This excludes other insured services that may be done in RHAs and FFS facilities.

Of the 380 public imaging devices, 54.7% of the equipment is greater than 10 years old, requiring 40.8% of the estimated budget replacement value or $56.5M.

Of the 104 FFS imaging devices, 41.3% of the equipment is greater than 10 years old, and would account for 35.5% of its estimated replacement value or $9.3M.

No analysis of the status of diagnostic imaging in Saskatchewan can fail to recognize that the Province has a cumulative deficit in capital spending. This limits any plans in the context of human resources or academic ambition and must be addressed on the basis of need.

To improve the quality of diagnostic imaging services in the province of Saskatchewan there has been investment to provide diagnostic imaging procedures that focus on high end imaging modalities such as MRI, multislice-CT and interventional imaging systems. Unfortunately, this comes at the expense of general radiography imaging systems, which provides 75% of the public DI services and 67% of the FFS DI services throughout the province (see table 61).

The issue with equipment age presents numerous logistical and fiscal challenges to all regions within the province. From a logistical standpoint the challenges are focused on various functional aspects associated with efficient and effective delivery of care. Currently, a majority of the general imaging units do not feature many of the technical advancements in automatic patient procedure technique protocols which have long been considered standard practice in today's imaging environment. These provide recognized benefits in patient care and efficiencies in patient throughput. Lack of these technology advancements in imaging modalities, imposes functional limitations to support latest advancements in diagnostic and interventional procedures, which reduces the effective capabilities of DI departments and inhibits DI service providers required to meet increased clinical demand.

Equally important is operational reliability, as equipment becomes increasingly difficult to maintain, due to the age of the equipment and parts availability. This will ultimately increase system downtime and adversely impact patient throughput and wait lists. Fiscal issues will center on increased operational costs associated with equipment maintenance, forced equipment replacement and possible increases in staffing costs to counteract inefficiencies and increased waitlists.

Further consideration (and the most acute) will be the inclusion of PACS, especially for imaging systems identified which utilize "electronic" forms of image capture in the production of diagnostic images. These systems are required to be DICOM compliant and must be either replaced or connected to an interface component to successfully communicate with PACS.

While a number of issues have been identified with the state of capital equipment, it should be noted that a dedicated effort to address the issues associated with aging capital equipment have been underway with the establishment of a position to focus on capital planning and acquisition, and through continued provincial initiatives in the acquisition and implementation of additional CT and MRI scanners throughout the province. The positive effects of these efforts can be seen in section 2.7.

In addition, some regions have begun to address the issues of aging systems as recent purchasing programs have included replacement of general radiographic imaging systems with DR (Digital Radiographic) general radiographic systems, Digital Mammography and "Digital Flat-plate" interventional fluoroscopic imaging systems.

3.5.1.3 Aligning Initiatives

The DI Net advisory committee should create a sub-committee of stakeholders including public and FFS DI service providers and consumers to develop a strategic equipment plan that aligns the appropriate mix of modalities and current and future clinical service requirements.

- Establish a sub-committee of the DINet for the strategic planning of diagnostic and therapeutic equipment, specifically including replacement and upgrade of existing equipment and the introduction of new technologies. Reporting to the DINet, the sub-committee will refine its' terms of reference, reporting structure, goals and objectives, roles and responsibilities, meeting times and timelines.
- Committee representation should include a diverse group of stakeholders to ensure the appropriate input is provided as is required.
- Part of the sub-committees role, should include the following:
    - Refine the existing baseline of DI equipment in Saskatchewan (i.e. items over $50,000). This would include updating the current equipment inventory of public and private facilities.
    - Quantify the value of the existing equipment to establish a starting point for a strategic asset management plan.
    - Perform or commission reviews of the evidentiary basis for the introduction and dissemination of new technology and to ensure consistency between public policy and evidence-based medicine.
- Develop common justification criteria and universal justification process guidelines for provincial implementation.
- Agree on a lifecycle approach, which takes into consideration agreed justification criteria and balances that with acceptable fiscal commitment.
- Develop a strategic plan for the replacement of existing equipment; upgrade path options, and the introduction of new technology (e.g., PET) based on established criteria. The plan should be managed on an ongoing basis and reviewed annually for ongoing refinement.
- Identify current clinical programs requiring DI services and determine which impact and are expected to change in the future and align those requirements into the equipment strategic planning process and align equipment clinical utility (e.g., CT – slices, MRI – field strength, etc) with clinical requirements.
- Consider other provincial programs initiatives (RIS/PACS, HQC, etc), their potential impact and align equipment planning with these requirements.
- Determine the role that public and FFS currently provide and clearly define future roles that builds on existing strengths to maximize the delivery of DI services.
- Develop a budget representative of provincial clinical requirements, taking into consideration a) catch-up requirements, b) immediate needs, c) long-term. requirements and d) the introduction of new technologies that focus on quality of care, efficiencies and fiscal benefits. The budget should be flexible to allow for change and adoptable in the case of unsuspecting emergency. The budget

should be dedicated to ongoing support of existing healthcare equipment infrastructure.
- Align the manpower plan to effectively address immediate and long-term requirements. Implementing a new plan with increased funding is doomed to failure without "qualified human resources" to operate the equipment.
- Develop an audit methodology to review implemented outcomes and compare that to the established "Canadian benchmarks".
- Develop an audit methodology to review implemented outcomes and compare that to other countries (OECD).
- Establish a provincial equipment service group that focuses on specific DI equipment requirements and augments OEM service providers.
- Develop multi-purchase (volume) replacement programs strategies with due consideration to public and FFS requirements.
- Explore alternative funding to support capital replacement financing through foundations, corporate support, private/public programs.
- Explore alternative payment programs to support capital replacement financing through leasing, ASP, provincial commerce and lease-back alternatives.

With the appropriate due process, communication, appropriate representation, and continued participation, we believe these recommendations will provide the basis for effectively dealing with current equipment issues and for ongoing equipment planning and management, regardless of the environment.

3.5.2 Informatics (RIS / PACS)

3.5.2.1 RIS / PACS Issues

Service providers noted that the implementation of a province-wide RIS would go hand-in-hand with the development of a PACS. The RIS/PACS would allow exams to be read and reported promptly, particularly in the northern regions of the province. However, a concern was expressed that a RIS/PACS initiative must not detract from the need to replace out-of-date equipment.

During the course of the review it was noted that there is a need to:

- develop a provincial-wide information management strategy with appropriate input from stakeholders;
- develop a complete and consistent assessment of the current state of DI;
- implement IT to standardize and adopt a filmless and paperless environment;
- facilitate consistent implementation and use of RIS/PACS technology;
- implement a common patient index strategy for the integration of care;
- develop a manpower plan to meet implementation and management needs;
- provide clarity with regard to the requirements and architecture necessary to meet a geographically distributed service requirement; and
- communicate a conceptual plan to all stakeholders.

Traditional plain film radiology involves the production and storage of X-rays using a film-based medium. In addition, various types of images are generated by computerized equipment such as CT, MRI, nuclear medicine, digital angiography, and ultrasound scanners which, although generated digitally, are stored as film-based images. However, a film can only be in one place at a time and when it is to be interpreted

elsewhere, it must be transported. Film storage is an increasing challenge, leading to space constraints and costs as well as requiring management of hard copies of images extending back over decades.

Exponential advances in the technology and computer industries have led to electronic innovations in radiology. RIS manage information; an RIS provides overall functional support for the daily activities of a DI department (including nuclear medicine), covering patient management, procedure management, and department management.[1] To be effective it must be compatible with and integrate with other information systems, including the HIS. The goal of an RIS is "the development of a robust practice environment that emphasizes workflow enhancements with seamless integration of decision support tools."[2]

Increasingly, radiology images are being captured digitally and managed using PACS -- high-speed, graphical, computer network systems which focus on communication. PACS vary in size and design but all are capable of (1) storage of digitized radiology images into a central image database (archiving); (2) access to these images from computer workstations; and (3) rapid transmission of images from the radiology acquisition devices to the archive and from the archive to the workstation.[3] Ideally, a PACS is integrated with an electronic RIS, which in turn is integrated with the larger HIS, contributing to the EHR. Linkage to other electronic tools such as decision support systems and teleradiology is also possible.

However, the transition from hard to soft copy can be complex and time consuming, as well as costly to acquire, replace, maintain, and repair.[4] Basically, PACS involves process re-design and cannot simply be imposed on a old radiology system if savings and efficiencies are to be gained. Also, PACS can be demanding of radiologists who may have to increase their availability to avoid other centres and radiologists taking over their role in image interpretation "on-line" remotely.

3.5.2.2 Advantages of an RIS

- Improving report turn-around time (a 2001 study from the USA showed turn-around time for reports dropped from 30 to 24 hours)[5]
- Increasing numbers of procedures performed, as well as enhancing practice efficiency[5]
- Coordinating order workflow from the RIS with image workflow from the PACS to maximize productivity and patient care[6]
- From the website of a vendor:[7]
    - improving department productivity by providing a link between the HIS and PACS
    - receiving requests electronically, including requests from other information systems and web requests from the referring community
    - facilitating the search for patient records
    - allowing sophisticated scheduling: automating multiple exam booking using pre-defined rules, preventing booking without designated resources, allowing privilege-based booking, prioritizing appointments, and generating patient preparation letters
    - eliminating redundant entry of patient demographics
    - providing the potential for keyboarding entries

- improving dictation functions with digital dictation
- providing simultaneous access by several people to clinical information
- autorouting information to administrative staff
- providing examination and report data to the HIS for billing,[xxxiii] statistical data, and management reporting
- allowing customization of reporting
- providing a continuously updated view of the image archives.

Note that many of the advantages of RIS depend upon the capabilities of the specific RIS, its compatibility with other modules, and whether the RIS is linked to specific functions supported by the HIS, EMR, and other IS.

3.5.2.3 Advantages of a PACS

A PACS can lead to both clinical benefits (such as improved diagnostic accuracy and patient outcomes) and operational benefits (such as workflow efficiency and reduced costs). A number of advantages to PACS are discussed in the literature:

A. Clinical benefits

- Providing rapid access to complete and legible information, reducing time to clinical interventions and improving satisfaction for providers and patients[8]
- Providing greater accuracy than that of film,[9] with standardization of image quality possible and improving diagnostic power as radiologists can window and threshold images
- Assembling of series of images over time to allow more complete follow-up[10]
- Increasing incidental findings, e.g., renal masses, aortic aneurysms, and lymph node abnormalities found on MRI lumbar spine studies[11]
- Allowing review of all relevant clinical documents in a patient medical record, including filtering material, identifying key information, and comparing historical images.[12]

B. Operational benefits.

- Reducing traveling time for patients and radiologists, when images are taken and interpretation carried out close to home[8,12]
- Reducing occurrence of missing images as patients will not need to transport their images to other physicians, fewer films will be misplaced, and errors reduced[8,13]
- Manipulating of PACS images, eliminating the need for retakes and reducing repeat patient visits and radiation exposure[8,12]
- Developing, organizing, and maintaining imaging files for teaching and digital libraries, allowing searching by diagnosis, findings, and demographics[13,14]
- Providing permanence (films deteriorate over time) and ready availability of data, obviating the need for conventional archives[15]
- Distributing images via the web,[16] including as web teaching tools[17]
- Integrating with transcription services[18]
- Improving productivity, job satisfaction, and workflow,[19] allowing re-deployment of human resources to other areas.

[xxxiii] In Canada, this may particularly aid in billings for physicians.

- Enhancing systems for ensuring medical image security[20]
- Cost savings:
    - A 2002 Italian study reported savings, primarily from workflow efficiencies and savings on human resources (rather than from reductions in film and chemicals)[21]
    - A USA study, savings were quantitated as a return on investment after 3.5 years and annual savings of $500,000 thereafter[22]
    - At Fraser Health in British Columbia (BC), PACS has been projected to result in savings by reducing duplicate images, transfers between hospitals and film costs[23]
    - At BC Children's / BC Women's Hospital, a PACS is reported to have saved $200,000 and is being further integrated with the BC Cancer Agency, allowing images to be available at sites throughout the province[24]
    - The Toronto Hospital installed a PACS in its ultrasound department in 1994 and found after one year there was no impact financially but increased efficiency, allowing the handing of the same number of studies (30,000/year) using 20% less operational time.[25]
- Allowing use of personal computer (PC) systems rather than costly workstations for some indications.[26]
- Facilitating multi-institutional research through a web interface for image review, data entry and data collection,[27] including the potential for population-based research
- Providing an enriched environment in which to adequately train DI residents who must learn the newest techniques and technology.[12]

C. Both clinical and operational benefits

- Facilitating consultations among experts who are geographically distant
- Varying image quality, depending on user needs
- Transmitting images across large distances, including applications such as teaching in the developing world[28] and provision of expertise to remote areas,[29] supporting health care providers and potentially enhancing recruitment to these areas[8]
- Allowing for image availability any time anywhere, including linking of hospitals and clinics, and viewing by multiple providers[30,31]
- Integrating with evidence-based tools and quality assurance programs[32,33]
- Downloading of images onto personal digital assistants (PDAs)[34]
- Managing scarce human resources by leveraging skills across communities,[35] e.g., low-volume clinics could be served by radiologists who also assist high-volume sites by reading images remotely, thereby using radiologist manpower efficiently.

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The Health Information Solutions Centre (HISC) is a branch of Saskatchewan Health that is assisting health regions in integrating health service delivery across the provincial health sector.

HISC is working with health regions, agencies and policy development branches of Saskatchewan Health to integrate network infrastructure and clinical applications so that health information is easily accessible by health providers and delivery agencies in a manner that enhances provincial health care delivery.

In addition, HISC manages the former SHIN network that electronically links all health regions and facilities, and many health agencies in the province. HISC also manages support services delivered to health system users across the province and centrally hosts many clinical applications accessed by regions, health organizations and Saskatchewan Health.

HISC, together with Canada Health Infoway (CHI), the Regional Health Authorities and professional associations are working together on the Provincial RIS/PACS (Radiology Information System/Picture Archiving and Communication System) initiative.

The objective of the project is a shared RIS/PACS solution for the province. All medical imaging studies and results could be captured and stored electronically in a central repository. This would enable immediate access to the studies and results by authorized physicians and other authorized clinical users, regardless of location. HISC is currently working to understand the requirements for the province of Saskatchewan.

The introduction of a "shared" RIS and PACS solution on a provincial basis will have a profound impact on the delivery of Diagnostic Imaging services across the province for both public and private delivery models. The ability to capture, store, interpret and view all images in an "electronic" film-less environment will ensure that all DI information (images and reports) are available for "any study" at "any time" from "anywhere" putting the patients information in the hands of healthcare providers anywhere within the province.

- any study – include all DI procedures performed on all imaging modalities
- anywhere – delivery of images and interpretation on an enterprise-wide level, over a secure network connection to an authorized users
- anytime – online accessibility to image and interpretation (real-time and stored) must be available on an enterprise-wide over a secure network connection to authorized user(s).

The current Saskatchewan RIS/PACS project is intended to be developed and to be implemented over a number of phases including;

- Phase 0 – Deployment Planning – the focus of the deployment planning phase is to define the activities, resource, schedule and the budget required to complete the planning process (Phase I) and provide an estimate of the effort required to complete the implementation process (Phase II).
- Phase I – Planning – this phase will focus on completing the detailed planning for the implementation of a Provincial RIS/PACS solution
- Phase II – Implementation – during this phase, the Provincial RIS/PACS solution will be rolled (phased implementation) out to the stakeholders.

Implementation requirements include:

- RIS system architecture including; server, data storage, and operating software
- PACS system architecture including; management server, HL7 interface, DICOM converters, workstations, web portals, and operating software
- Central archiving solution: system architecture including short and long-term storage, and disaster recovery
- CR technology/readers: MEDIA conversion systems for film-based imaging systems
- System implementation costs and training
- DI re-engineering costs requirements
- Ongoing system maintenance costs.

The vision for shared RIS/PACS should consider that it be a fully integrated RIS/PACS solution for all health organizations including public and private sector imaging facilities. The RIS/PACS solution should:

- align with DISC clinical requirements for the optimum delivery of DI services in the province of Saskatchewan.
- allow for all modalities to be connected, transferring all diagnostic Images to a centralized Provincial Archive in order to provide efficient access of DI services for the province
- be part of a province-wide, comprehensive Electronic Health Record (EHR) of which both RIS and PACS become seamlessly integrated modules of the EHR at a provincial and regional level and accommodates public and FFS requirements
- allow for continuous growth of the RIS/PACS solution must be designed on a platform that incorporates standard informatics protocols such as; IHE, HL7, DICOM and CCOW requirements and initiates a single patient identifier and system architecture that is versatile enough to support continuous upgrade and expansion of both the RIS and the PACS to meet operational requirements for users without incurring limitations or redundancies.

3.5.3 Recommendations

THE FOLLOWING ARE RECOMMENDED:

11. AN INVENTORY OF CAPITAL ASSETS BE DEVELOPED AND UPDATED ON AN ANNUAL BASIS

12. A PLAN IS DEVELOPED TO REPLACE EQUIPMENT AT APPROPRIATE INTERVALS IN THE PUBLIC AND PRIVATE SECTORS

13. A PROVINCE-WIDE RADIOLOGY INFORMATION SYSTEM (RIS) / PICTURE ARCHIVAL AND COMMUNICATION SYSTEM (PACS) BE PLANNED AND IMPLEMENTED AS PART OF THE ELECTRONIC MEDICAL RECORD (EMR);

14. ACCESS TO THE EMR SHALL BE AVAILABLE IN ALL PARTS OF THE HEALTH CARE SYSTEM

3.6 FUNDING AND REIMBURSEMENT

3.6.1 Funding and Reimbursement Issues

Various sources of data were tapped; however, a number of challenges were identified when the data were used for comparisons:

- Lack of standardization of statistical reporting: A review of the information on services provided by RHA-funded facilities showed that statistical reporting has not, in the past, been standardized across all regions, resulting in inconsistent data collection among the RHAs and between RHAs and Saskatchewan Health.
- Limitations in the ability to compare MSB-insured services across facilities: A review of the background information pertaining to MSB-insured services and services performed in RHA facilities revealed that it is not always possible to determine the total DI costs within a health region, nor is it possible to compare different hospitals' payments to their physicians. Different hospitals use different sets of codes to track physician DI services and related payments within their site(s); not only do these codes differ from hospital to hospital, but they also differ from those used by MSB. In some cases hospitals use MSB codes, but for completely different services. It also appears that the amounts paid to physicians differ.
- Lack of information on site of service delivery: Data on MSB-insured physician DI services can be obtained from Saskatchewan Health. However, it has limitations. In particular, it is not possible to ascertain in which region DI services were actually performed as physicians who delivery services in more than one health region may have all income attributed to the region in which they have their "home" MSB account. In these cases, analyses of MSB billings fail to capture the region in which the services were provided.
- Lack of transparency: It is not possible to share MSB billing information with stakeholders.
- Hospital versus FFS billing: It is not possible to differentiate between the MSB-insured fees paid for performance of special procedures in hospitals and those paid in private FFS facilities.

During the course of the review it was noted that there is a need for:

- standardized statistical reporting and systems which will allow consistent reporting among RHAs and between RHAs and Saskatchewan Health;
- better coordination of operating funding sources (MSB, Regional Advisory Boards (RHAs), AESB);
- a system to allow differentiation between MSB special procedure billings in hospitals and those in the private FFS sector;
- a system to allow identification of sites where MSB-funded examinations have actually been performed;
- consistent application of MSB fee codes when used for internal RHA/hospital billing, as well as for RIS planning, recruitment, etc.;
- consistent reimbursement for radiologists working in different RHAs;
- an understanding that Workers' Compensation Board (WCB) will "shop locally" facilities and care providers in Saskatchewan.

3.6.2 Literature

Background

There is scant literature reporting on payment of radiologists in Canada and no published information specifically on payment of nuclear medicine physicians. Of the references located, most are from the USA where the health care system differs significantly from that in Canada. When seeking specific payment information, a complication is the fact that billings/earnings for radiologists may be excluded from physician payment reporting for various reasons: (a) for radiologists outside hospitals, total billings cover facility overhead and only a proportion of this represents personal income; (b) in some jurisdictions radiologists are paid through hospitals or health authorities, not through the medical plan, and data are not easy to obtain; and (c) data are generally not complete or uniform due to marked variability in funding schemes.[1]

Possible forms of Remuneration

The Canadian Institute for Health Information (CIHI) conducts research into payment of physicians in Canada, with its National Physician Database (NPDB). The 2004 document "Alternative Payments and the NPDB" provides definitions for a number of methods of paying physicians:[2]

1. *Clinical fee-for-service* refers to payment of claims submitted for individual services
2. *Alternative clinical* refers to all payments made for clinical services provided by physicians and not reimbursed on a FFS basis. These can be:
    a. *Salary:* physicians employed on a salaried basis -- common in settings such as cancer centres and pediatric hospitals where practice styles do not lend themselves to FFS
    b. *Sessional:* payments on an hourly or daily basis
    c. *Capitation:* monthly payments for clients rostered with a physician group
    d. *Block funding:* budgets negotiated for a physician group, e.g., an academic centre
    e. *Contract and blended:* blended alternative arrangements and FFS
3. *Northern and under-serviced* refers to funding of provincial/territorial programs to provide alternative modes of payments, usually in addition to other payment schemes
4. *Emergency and on call* refers to payments for services in emergency departments or for physicians on call; they may supplement FFS as call-back fees, or replace FFS
5. *Non-clinical payments (not included in the NPDB)*
    a. *Hospital-based physicians:* funding provided to health authorities or hospitals for radiology and pathology, as well as other physicians employed by hospitals and paid through hospital budgets, e.g., chiefs of staff, medical health officers, chairs of departments
    b. *Special incentives:* moving expenses, recruitment/retention bonuses, etc.
    c. *Benefits:* contributions by provinces/territories for Canadian Medical Protective Assurance, continuing medical education, pensions, or disability insurance

Perspectives from the literature

(A) Trends in radiologist earnings and workload

The majority of literature obtained was from the USA. The American College of Radiologists (ACR) surveyed its members (n=449) to determine trends in billing and found decreasing success in receiving payment over the period 1992-1999; revenues as a percentage of billed charges dropped from 71% to 55%. In addition, the average payment for a typical radiology service decreased by 4% over this time period (19% when adjusted for inflation).[3] In contrast, the ACR found that workload has been increasing: compared to 1995/6, workload increased in 1998/9 by 8.5% per FTE radiologist to an average of 12,800 procedures/year (9400 in academic settings versus 13,600 in private practices) and complexity of procedures increased as well.[4]

In a 1997 study, the ACR collected starting salaries of new radiology graduates (n=487), using multiple regression analysis to relate incomes to other factors. They found that determinants of income are multiple and varied: in particular, academic starting salaries were lower than private practice by 6%, salaries for residency-only graduates were lower than fellowship-trained graduates by 7%, more managed care in a locality was associated with lower incomes, whereas a higher percentage of elderly was associated with higher incomes. There was no association between salary and: sex, job location, field of subspecialty training, local per capita income, or local cost of living.[5]

Changes in the sex ratio of radiologists, radiation oncologists, and nuclear medicine specialists over time in the USA was examined in 1995 (n=1934). Findings were: 13% of radiologists were women (23% under age 35 versus 6% age 45+); and that women in these specialties were more likely to be salaried, working part-time, teaching, and working in an office versus hospital, than their male colleagues.[6] Data from CIHI reports that in Canada in 2001, 22% of radiologists and 17% of nuclear medicine physicians were women.[7]

(B) Management considerations

Some radiologists work in hospitals (in part or exclusively) and some work in private facilities, in essence as entrepreneurs. Management to achieve efficiency is important in all types of facilities. Schmidt and colleagues[8] performed an in-depth analysis of a managed care setting in the USA because they observed that costs were escalating relative to billings and that similar health plans were not experiencing this mismatch. They found problems in management, administration, information technology, and risk arrangements. They also observed that physicians with equipment in their offices ordered four or five times more imaging procedures than physicians who did not perform imaging studies themselves.

In another American study, authors found that self-referral can drive utilization when physicians have equipment at their own facilities.[10] Practice costs in the USA were also examined through survey in 1996/1997 (n=170) and reported per FTE radiologist. Total practice costs came in at $90,000 to $190,000 per FTE; per procedure costs were $9 to $21; and as a percent of revenue, ranged from 27 to 41%.[9] Finally, the point was made by one author that use of new technologies brings challenges, one being the securing of a reimbursement arrangement. Lack of this “technicality” means new technologies are not taken up and used.[11]

(C) Initiatives

Several articles from the USA described initiatives to influence costs in radiology, including radiologists' incomes. One was an attempt to reduce costs and the other the reverse -- an attempt to increase revenues. The cost-control initiative was a readjustment of the Medicare fee schedule to control costs but also to narrow the gap in earnings between primary care and procedure-based physicians in an attempt to attract physicians into primary care. Weeks and Wallace (2002)[12] surveyed six physician groups, including GPs, to determine whether this fee schedule adjustment had achieved its goal; unfortunately the initiative did influence choice of specialty. The authors also found that academic physicians were underpaid relative to their private sector colleagues and expressed a fear that physicians may not choose academic careers as a result.

The second report[13] suggested the focus for hospitals should shift from cutting costs to increasing revenue, in particular by moving appointments for DI procedures from the inpatient to the outpatient setting. The author proposed that inpatients who have CT, MRI, and nuclear cardiology studies ordered a day or so prior to discharge should have these procedures performed after discharge. In this study, of the 323 CT and MRI studies performed on inpatients just prior to discharge, 83% were positive and the patients were discharged anyway – in other words, the procedures could have been carried out as outpatients without affecting outcomes.

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3.6.3 Recommendations

THE FOLLOWING ARE RECOMMENDED:

15. TRANSPARENT AND COMMON METHODS OF REMUNERATION FOR THE ENTIRE PROVINCE BE DEVELOPED IN COLLABORATION WITH SMA

16. REMUNERATION INCLUDE PAYMENT FOR ACADEMIC AND ADMINISTRATIVE ACTIVITIES

17. SELF-REFERRAL BE DISCOURAGED IN ANY CONTEXT

4.0 IMPLEMENTATION AND COMMUNICATION

4.1 Implementation Plan

This plan acknowledges that to achieve a fully integrated DI service throughout the province, a province-wide RIS/PACS system is in place and fully integrated with an electronic health record. This plan recognizes a staged implementation based on this requirement.

Short-term* requirements are:

- Sask Health establishes a provincial committee based on the preferred model;
- Sask Health, in conjunction with the provincial committee, confirms projected demand for the province as a whole and within each regional health area based on benchmarks for appropriate utilization;
- Appropriate bodies to define appropriateness criteria for DI;
- RHAs, and their medical staffs, adopt, implement and monitor appropriateness criteria;
- RHAs identify HR requirements and Sask Health establishes a provincial HR plan;
- Sask Health finances RHAs for DI that financially rewards them for achieving best practices and allows them to reallocate such funds to improving DI in their geographical area;
- Interpretation and reporting of tests should be performed by physicians who have qualifications as determined by the College of Physicians and Surgeons;
- College of Physicians and Surgeons establish province -wide accreditation program for all modalities applicable to public and private clinics;
- Utilization of expensive DI equipment is maximized through extended hours; and,
- RHAs establish an inclusive process to involve radiologists/nm in planning for delivery of DI services in their geographical area.

Long-term requirements associated with implementation of RIS/PACS and electronic health records:

- Establish electronic provincial waitlist for CT, MRI, bone density and nuclear medicine services;
- RHAs report publicly on wait times for CT and MRI;
- Establish radiology scheduling system for non-emergent services and electronic ordering with embedded appropriateness guidelines; and,
- Establish province-wide interpretation model.

* Short term is considered 12 months.

4.2 Communication Plan

Communication strategies will target several audiences. They are: public, RHAs, radiologists/nm, medical community in general, SMA and internal government. Specific messages consistent to the audiences are:

- Sask Health is ultimately responsible for the delivery of Diagnostic Imaging (DI); with selection of the preferred model determining who is responsible for governing and managing DI
- There is a need for adequate numbers of trained professionals and technologists in the province
- Quality DI services in the province are not sustainable under the current arrangement of organization and financing
- A systems approach and province-wide planning is required to improve access for all residents
- Considerable investment in technology (RIS/PACS) and new imaging equipment is required to position the province for future opportunities and deliver quality services
- Government supports compensation levels comparable to other jurisdictions
- A province-wide system will contribute to fairness in access and will provide better clinical support to physicians in rural and northern areas rather than reduce local services as a result of centralization of specialty services; and,
- Share the report as information, and seek further input, from the Minister's Forum, Leadership Council, College of Physicians and Surgeons, College of Medicine, RHAs and CAR.

Abbreviations

ABCC	Allan Blair Cancer Center
ACR	American College of Radiologists
ADT	Admit/discharge/transfer [software]
AECB	Atomic Energy Control Board
AESB	Acute and Emergency Services Branch
BC	British Columbia
CAMRT	Canadian Association of Medical Radiation Technologists
CAR	Canadian Association of Radiologists
CEO	Chief executive officer
CHI	Canada Health Infoway
CIHI	Canadian Institute for Health Information
CLS	Canadian Light Source
CLXT	Combined laboratory-X-ray technicians
CMA	Canadian Medical Association
CPG	Clinical practice guideline
CRHA	Cypress Regional Health Authority
CT	Computed tomography
DAP	Diagnostic Accreditation Program
DI	Diagnostic imaging
DICOM	Digital Imaging and Communications in Medicine [standards]
DM	Demand management
EMR	Electronic medical record
ER	Emergency room
FFS	Fee-for-service
FHRHA	Five Hills Regional Health Authority
FTE	Full time equivalent
GP	General practitioner
HC	Health centre
HIS	Hospital Information System
HISC	Health Information Solutions Centre
HL7	Hospital level 7 [software code]
HQC	Health Quality Council
HR	Human resources
HRHA	Heartland Regional Health Authority
ICES	Institute for Clinical Evaluative Science
IS	Information system
IT	Information technology
IV	Intravenous
KTRHA	Kelsey Trail Regional Health Authority
KYRHA	Keewatin Yatthe Health Authority
LIS	Laboratory Information System
MCRRHA	Mamawetan Churchill River Health Authority
MJUH	Moose Jaw Union Hospital
MRI	Magnetic resonance imaging
MRT	Medical radiation technologist
MSB	Medical Services Branch
NPDB	National Physician Database [of CIHI]
OEMs	Original equipment manufacturers
PA	Physicians assistants
PACS	Picture archiving and communication system
PAPRHA	Prince Albert Parkland Regional Health Authority
PC	Personal computer
PDA	Personal digital assistant
PET	Positron emission tomography

PNRHA	Prairie North Regional Health Authority
RA	Radiologist assistant
RAB	Regional Advisory Board
RHA	Regional health authority
RIS	Radiology information system
RN	Registered nurse
RQRHA	Regina Qu'Appelle Regional Health Authority
RUH	Royal University Hospital
SADMS	Saskatchewan Society for Diagnostic Medical Songraphers
SAHO	Saskatchewan Association of Health Organizations
SCA	Saskatchewan Cancer Agency
SCC	Saskatoon Cancer Centre
SCM	Sunrise Clinical Manager [software]
SHIN	Saskatchewan Health Information Network
SMP	Screening Mammography Program
SPECT	Single photon emission CT
UK	United Kingdom
USA	United States of America
WCB	Workers' Compensation Board
WCWL	Western Canada Waiting List Project

Tables

SASKATCHEWAN HEALTH – PROVINCE-WIDE DIAGNOSTIC IMAGING REVIEW

STEERING COMMITTEE: TERMS OF REFERENCE

PURPOSE:

The Steering Committee will oversee the review of diagnostic imaging in Saskatchewan and the development of a provincial diagnostic imaging strategy including providing direction to the consultants.

The committee will provide a broad perspective for the consultants and will resolve, support, and expedite decisions and issues presented to it by the consultants. Committee members will be expected to act as a communications link between the areas they represent, the consultants and the committee work. The committee will review the final recommendations and recommend an action plan.

ROLE OF COMMITTEE MEMBERS:

1. Committee Chair:
    - Guide the committee through the process
    - Prepare agendas and chair the committee meetings
    - Distribute the committee workload
    - Ensure quality and thoroughness of committee outputs
    - Monitor progress and help resolve issues which arise
    - Communicate regularly with the consultant team and committee members
2. Consultants
    - Perform the agreed scope of work
    - Assist the Chair and members with work planning
    - Help facilitate the meetings
    - Coordinate project components as required
3. Committee Members
    - Attend and actively participate in various meetings
    - Act as liaisons between the project and peers
    - Represent various regions, departments and levels
    - Provide information as requested
    - Seek input from areas represented and other stakeholders
    - Identify issues and improvement ideas
    - Ensure work is linked to work around increasing DI capacity (MRI, CT) and the development of a provincial RIS/PACS strategy
4. Committee Representation
    - Dr. Peter Glynn, Committee Chair
    - Dr. Dennis Kendel, Registrar, College of Physicians & Surgeons
    - Dr. Ted Lembke, Radiology Associates of Regina
    - Dr. Brent Burbridge, Academic Head, Saskatoon RHA
    - Ms. Diane Larrivee, VP Specialty Care, Regina Qu'Appelle RHA
    - Ms Sandra Blevins, VP Clinical & Operations Support, Saskatoon RHA
    - Ms. Suann Lauent, Ex. Director of Acute Care & Emergency Services, Sunrise RHA
    - Ms. Cheryl Craig, VP Clinical Services, Five Hills RHA

- Dr. Vance Chow, Saskatchewan Medical Association, Radiology Section
- Dr. Tyrone Josdal, Family Physicians, Medical Consultant
- Ms. Lauren Donnelly, Executive Director, Acute and Emergency Services, Sask Health
- Ms. Donna Magnusson, Dir. Policy and Alternative Compensation, Med Services Branch, Sask Health
- Mr. Ron Knaus, Director of Planning, Health Human Resource Planning

- Mr. Doug Calder, Director, Specialized Services Acute and Emergency Services, Sask Health
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