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NIAGARA HEALTH SYSTEM
SYSTÈME DE SANTÉ DE NIAGARA
TOGETHER IN EXCELLENCE - LEADERS IN HEALTHCARE

Report on Regional Laboratory Services

March, 2005

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I. INTRODUCTION AND BACKGROUND

PROJECT PURPOSE AND OBJECTIVES

The Niagara Health System is undergoing a significant transformation as a result of the revised Health Services Restructuring Commission's recommendations and the realignment of organization's clinical care delivery model being structured around the programmatic approach. The Laboratory Medicine Program review project was designed to undertake an operations review to assess the current circumstances related to the delivery of laboratory services in the Region, and to position the NHS to make informed business and clinical decisions related to laboratory services within the context of the revised HSRC directions and programmatic approach.

- Documenting the strengths, issues and major risks associated with the current service delivery model, to serve as a basis for recommended service delivery enhancements.

- Developing a Laboratory Regional Service Delivery Plan that makes recommendations:

  - Test menu composition and referral patterns by site;
  - Management and organizational structures;
  - Human resources and staffing; and
  - Budget and financial components.

The project was divided into four phases:

- Phase 1 Initiate and gather data and information.
- Phase 2 Data analysis, data assessment and formulation.
- Phase 3 Identify strategic priorities, key results and strategies.
- Phase 4 Prepare draft report, and presentation to the NHS Laboratory Medicine Executive Committee and Senior Administration Team.

APPROACH AND METHODOLOGY

The project work included on-site visits to several hospitals (i.e., Welland Hospital Site (WHS), St. Catharines General Site (SCG), Greater Niagara General Site (GNG), Douglas Memorial Hospital Site (DMH), Port Colborne General Site (PCG), Shaver/Rehab Hospital (SRH), Niagara On The Lake Site (NTL) in the Region for information gathering purposes. The Hotel Dieu Hospital (HDH) had been visited in a previous engagement. Interviews with key regional laboratory staff at

the sites listed above, other key Regional personnel. Laboratory liaison physicians across the Region were surveyed to gather their perspectives regarding service provision. The consultant also received and reviewed all relevant documentation requested and provided, including historical data and reports.

A planning session was held with laboratory administrative staff, site supervisors and medical staff (i.e., pathologists) to obtain their collective input into the review process and approval of statistical and financial information. As well, a second meeting was held with the Medical Director and Site Directors to review and discuss key issues and implications.

A final meeting was held with the Steering Committee to review and discuss key findings and recommendations.

DATA COLLECTION ACTIVITIES

Templates were used to collect data from each site in the Region specific to laboratory operations and infrastructure. Data collected included:

- Test menus and volumes per site and across the Region;
- Referral patterns and referral agents;
- Hours of operation;
- Instrumentation and equipment;
- Staffing;
- Current LIS in use (if any);
- Financial data per site;
- Data transferred internally within the Region and externally; and
- Current analytical instrument environment.

Data collection activities also included surveying laboratory liaison physicians to gather perspectives on service delivery, access and reporting and consultation services (i.e., pathology, etc.).

Interview Program

Informal interviews were conducted with the laboratory management and medical leaders. The interviews included:

- [redacted]
- Key Physicians (i.e., Pathologists);
- The Laboratory Administration Team;

- Site Supervisors and front line staff in hospitals including WHS, GNG, SCG and HDH.

Site Visits

The consultants visited major laboratory sites across the Region. These sites were selected as they operate as major centres in the Region and are able to provide insight on the issues and challenges faced from a service delivery perspective.

The site-specific information gathering process included the following:

- Hours of operation;
- Clinical services/programs supported;
- Laboratory services presently offered;
- Organizational structure;
- Work processes;
- Staffing;
- Site specific issues/problems; and
- Future considerations.

FINANCIAL AND VOLUME ANALYSIS

Financial and test volume data was collected and consolidated into a standardized regional framework using the MIS guidelines. The data was verified back to source documents including the financial data provided by the NHS financial system. The financial and test volume information presented in this report is as accurate as possible given the variety of sources. It should be noted that the test volume and financial data was revised on numerous occasions throughout the project and reviewed by the Laboratory Management Team.

The current budgets for all sites are as follows:

Facility Name	03/04 Actual	04/05 Budget
St. Catharines General Lab Comb	$4,147,214	$4,270,794
St. Catharines General Pathology	$961,073	$826,431
CRP Lab Admin	$5,055	$105,184
St. Catharines General Pathology Reporting	$47,639	$51,677
St. Catharines Total	***$5,160,981***	***$5,254,086***
St. Catharines General Site	$5,160,981	$5,254,086
Hotel Dieu Hospital	$2,703,853	$3,651,778
Welland Hospital Site	$2,769,292	$2,995,573
Greater Niagara General Site	$3,322,734	$3,485,127
Douglas Memorial Hospital Site	$864,815	$782,380
Port Colborne General Site	$994,135	$1,005,219
Shaver/Rehab Hospital Site	$200,612	$223,208
Niagara on the Lake Site	$145,106	$165,125
NHS Regional TOTAL	**$16,161,528**	**$17,562,496**

(The difference between the 03/04 actual and the budget for 04/05 is 8.7%.)

The following table indicates the number of on-site and referred tests completed in the Region, organized by facility:

Summary of Test volumes in NHS				
Site	On-Site Volumes	Volume Referred Out	Total	On-Site as Percent of Total
Hotel Dieu Hospital	417,370	17,361	434,731	96%
St. Catharines General	589,894	63,632	652,526	90%
Greater Niagara General	376,974	14,492	391,466	96%
Welland Hospital	279,706	46,418	326,124	86%
Douglas Memorial Hospital	69,689	5,014	74,703	93%
Port Colborne General	89,687	12,561	102,248	88%
Niagara-On-The-Lake		57,200	57,200	0%
Shaver/Rehab Hospital		26,421	26,421	0%
Total	1,823,320	243,099	2,065,419	

The breakdown of testing is as follows:

- The SCG site is the largest in both on-site testing and also in referred out testing. The HDH is the next largest with GNG and WHS following closely.
- When the HDH volumes are moved to SCG this will create a large testing site for the NHS.
- The current model is not well organized with very little transfer of testing between sites. The other hospitals not very strongly supported by SCG in testing patterns.
- The HDH has been outside of this model and worked independently.
- Neither NTL nor the SRH have onsite testing and all testing is send to MDS.
- All microbiology for the region is sent to MDS.
- Test referral and pattern changes within St. Catharines has decreased HDH test volumes and increased SCG volumes. *(Note: The HDH budget has not decreased over this same period, but has increased by $947.925)*

II. KEY FINDINGS OF THE OPERATIONAL REVIEW OF LABORATORY SERVICES

NIAGARA HEALTH SYSTEM LABORATORY OVERVIEW

During the next year the provision of laboratory services in St. Catharines, will be centralized into the SCG location. The laboratory at the HDH will be closed and HDH will be responsible for the cost of the testing at the SRH (a rehabilitation hospital). This report will not discuss the current HDH situation but will deal with the transfer of testing to SCG. The funds for HDH to pay for these tests will be provided to them based upon the actual costs of the current volumes. The SCG will be the major testing site for the NHS within the Niagara Region.

Currently the PCG and the DMH sites provide services to very small communities with support offered from the WHS and the GNG site respectively.

NTL and the SRH do not provide any testing on site. All testing is transported to MDS and testing is provided by MDS.

A range of laboratory services are available throughout the Region based on population, referral patterns and clinical need. Services are provided in the following centres:

- St. Catharines – The SCG will be the major laboratory testing location for the Region; testing includes ; hematology, routine chemistry, immunology, coagulation, immunohematology, immunoassays, histology, cytology, morgue and autopsy services, and inpatient and outpatient phlebotomy
- St. Catharines – SRH -Inpatient phlebotomy is managed by MDS all testing goes to MDS;
- Niagara Falls – GNG testing includes; hematology, routine chemistry , immunology, coagulation, immunohematology, imunoassays and histology, inpatient phlebotomy;
- Welland – WHS testing includes; hematology, routine chemistry , immunology, coagulation, immunohematology, immunoassays and histology, inpatient and outpatient phlebotomy;
- Fort Erie – DMH testing includes hematology, routine chemistry , immunology, coagulation, immunohematology and immunoassays;
- Port Colborne – PCG testing includes includes hematology, routine chemistry , immunology, coagulation, immunohematology and immunoassays, inpatient and outpatient phlebotomy, EKG;
- Niagara-On-The-Lake – NTL provides inpatient phlebotomy and EKG, all testing goes to MDS.

A total of 1,823,320 tests were completed on-site in the NHS for 2004. Of this, approximately 1,007,264 (55%) were completed in St. Catharines. This is the combined SCG and HDH laboratories. And 656,680 (36%) were completed in the secondary hubs (i.e., WHS and GNG, with the later hospital completing 57% of the total) and 159,316 (8.7%) were completed in feeder hospitals (i.e. PCG and DMH).

Laboratory collection services are the only services available in the NTL and the SRH. Private laboratory collection services are also provided throughout the Region. The NHS provides consultative services, specifically pathology services on a regional basis with site Medicals Directors for all locations.

The NHS utilizes MDS, a private service provider for the following services:

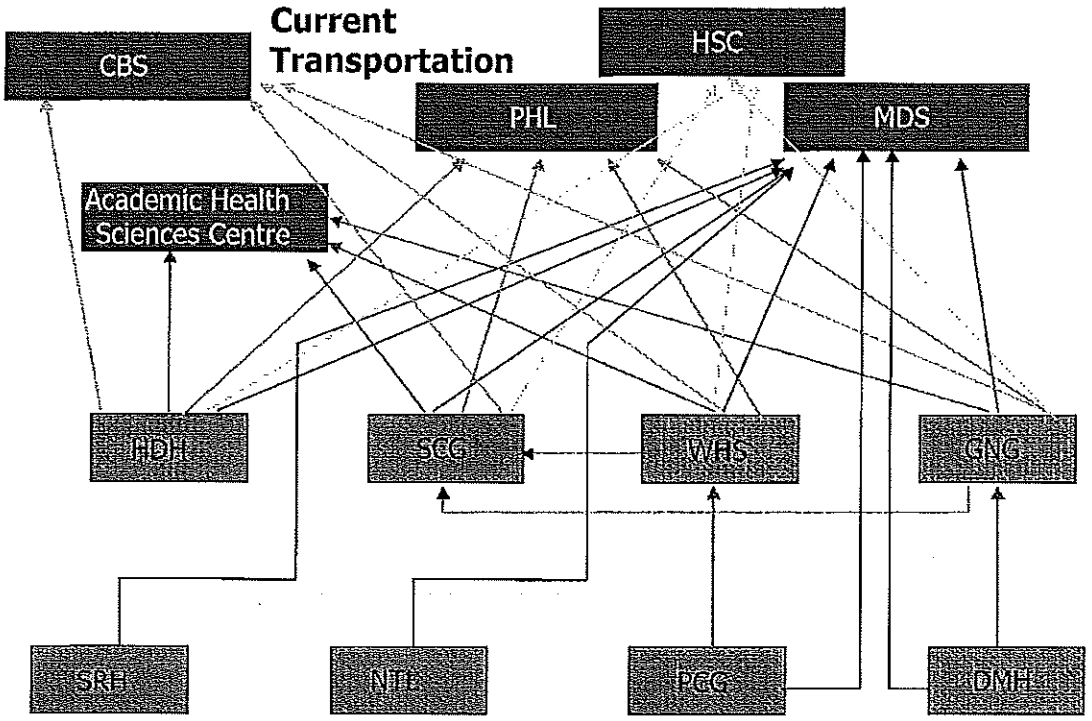
- Management of the technical and business components of the NHS laboratory services
- Provision of a Regional Director of Operations and two (2) Laboratory Site Technical Managers
- Assistance with cytology technologist services
- Monthly operational reports
- Technical and quality support
- Transportation
- Responsibility for accreditation.

Quality Assurance

The NHS has created a new management position to support the Quality Assurance processes in the NHS. This position is working on the implementation of the QMP-LS accreditation guidelines. Quality Assurance is planned and implemented in a true regional model.

Transportation Networks

MDS provides transportation for the NHS. The current movement of specimens can be seen in the diagram below:



Laboratory Information System (LIS)

The NHS has a fully integrated LIS system. This has been excellently designed and implemented. The system in use for the NHS is Meditech. All testing results from MDS are available on this system.

COMPARISONS

Detailed comparative data for the NHS Laboratories is indicated below. (Note: This data is from the ORLSP process with the current NHS data and the percentage increase over the last 3 years indicated separately.)

The following table compares the NHS with multiple sites from within Ontario and outside Ontario. The yellow highlighted areas are where the indicator is the furthest from the group of values of the total hospitals and also from within the NHS/HDH. The purple highlighted area is where the indicators is the best from within the total hospital group and within the NHS/HDH.

NHS 2001/02 Indicators			
Location	Lab Cost/Test	Lab/Cost/FTE/Day	Lab Tests/FTE/Day
Hotel Dieu Hospital	$ 7.81	$ 427.15	55
St. Catharines General	$ 7.62	$ 374.25	49
Greater Niagara General	$ 12.44	$ 374.50	30
Welland Hospital	$ 10.54	$ 422.79	40
Douglas Memorial Hospital	$ 12.01	$ 317.43	26
Port Colborne Hospital	$ 7.44	$ 418.67	56
NHS/HDH Combined	$ 9.04	$ 394.92	44
Comparator A - 1 site	$ 10.19	$ 428.50	42
Comparator B - 2 sites	$ 6.48	$ 420.12	65
Comparator C - 2 sites	$ 8.81	$ 356.73	41
Comparator D - 5 sites	$ 9.47	$ 395.67	42
Comparator E - 1 site	$ 7.75	$ 350.48	45
Comparator F - 3 sites	$ 5.68	$ 356.64	60
Comparator G - 3 sites	$ 5.79	$ 434.97	75
Comparator H - 5 sites	$ 8.21	$ 432.37	53

NHS 2004/05 Indicators			
Location	Lab Cost/Test	Lab/Cost/FTE/Day	Lab Tests/FTE/Day
Hotel Dieu Hospital	$ 8.76	$ 536.08	61
St. Catharines General	$ 8.91	$ 519.49	58
Greater Niagara General	$ 9.25	$ 457.49	49
Welland Hospital	$ 10.71	$ 507.55	47
Douglas Memorial Hospital	$ 11.23	$ 470.18	42
Port Colborne Hospital	$ 11.21	$ 529.62	47
NHS/HDH Combined	$ 9.63	$ 512	53
Hospital #1	$ 11.34	$ 580.52	51
Hospital #2	$ 4.90	$ 419.28	86
Hospital #3	$ 7.13	$ 279.30	39

Graphs

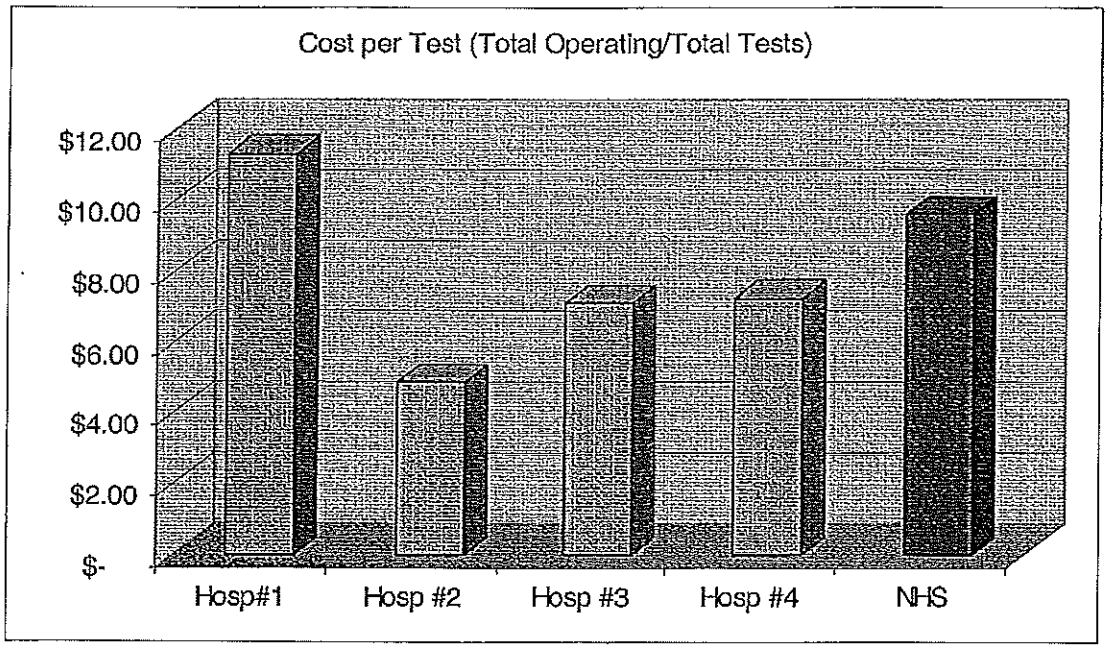
The data from the above tables have been arrayed in a series of graphs for greater clarity. Each of the three exhibits looks at a different set of data. This data provides information to the laboratories on their efficiency with respect to other peer hospitals.

- In each exhibit, the last bar is the NHS.
- Hospital #1 is a large Region in Alberta. This region consists of 20 hospitals, a single large geographic location and services provided by multiple private-sector providers.
- Hospital #2 is the This is an academic health sciences centre that does referral work for and beyond and supports two other sites that are not high volume. This hospital was used in the benchmarking as it has a high cost of transportation, services multiple sites but at the same time does high-cost esoteric testing.
- Hospital #3 is a small rural location in Ontario with multiple sites.
- Hospital #4 is a larger geographic centre in Ontario with dispersed population.

Benchmarking has inherent errors as each organization records and maintains different elements within the laboratory budgets. These hospitals were chosen as they represent the closest comparators to the NHS. It must be noted that the NHS is unique. This comparative information should therefore assist the NHS in the review of its laboratory services, but is not definitive of either efficiency or effectiveness. Again, benchmarking provides a basis for reviewing the operations of the laboratory and provides targets to move towards.

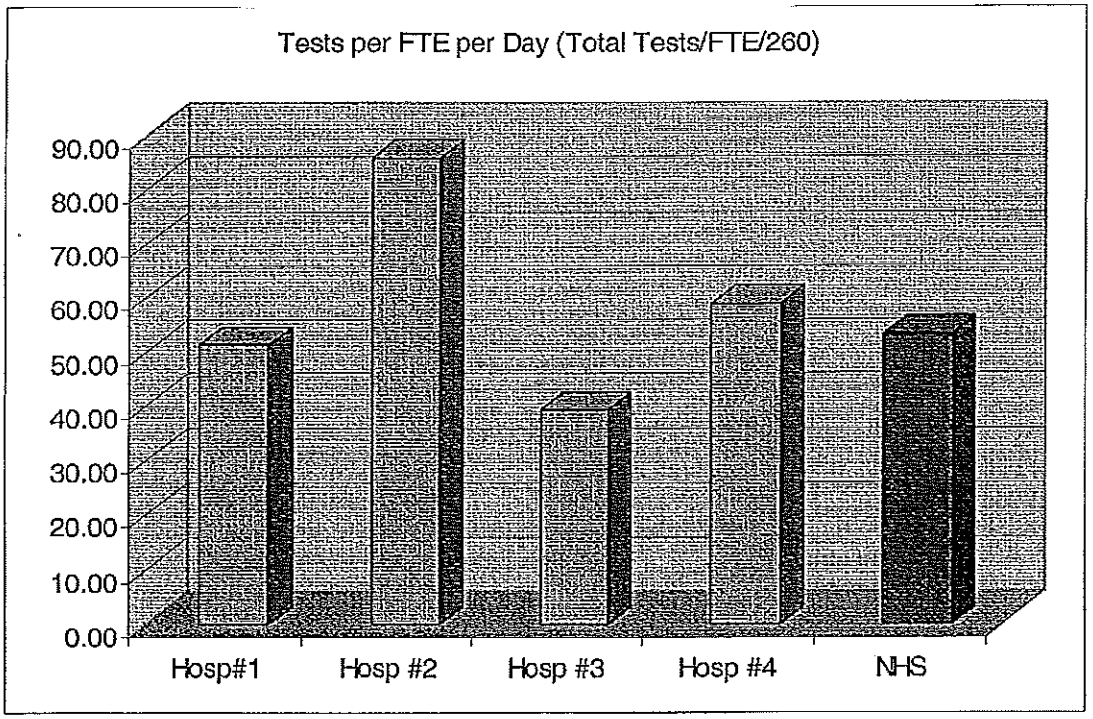
Cost Per Test

The cost per test graph indicates the total costs of operations against the total number of tests. A high cost per test will be seen in a site doing esoteric testing. In a laboratory providing high volume routine testing, this benchmark number should be low.



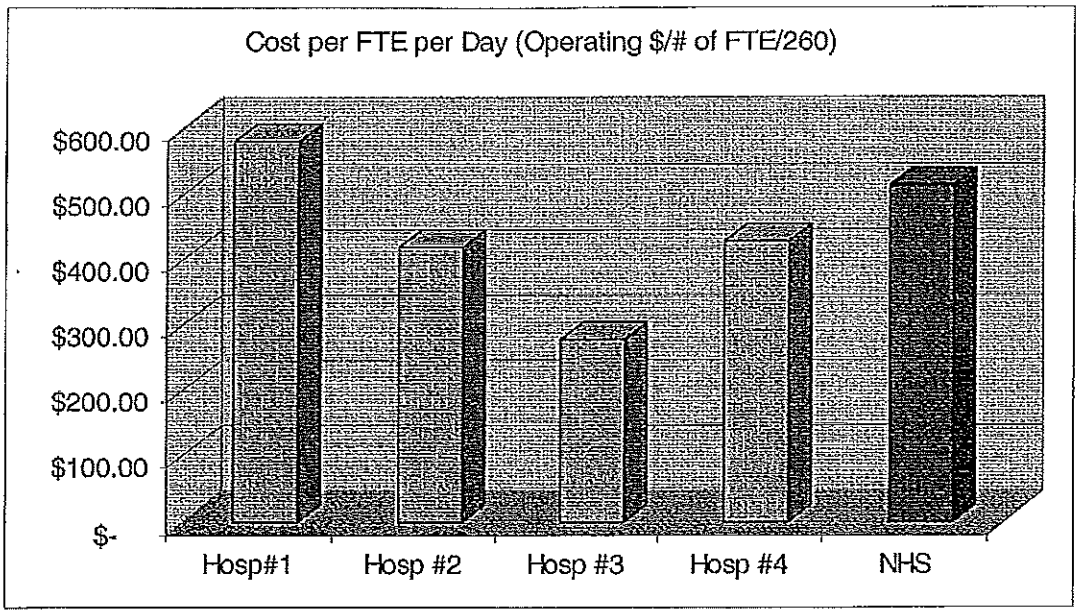
The NHS is at $9.63 per test when not including the referred out testing volumes. The cost per test is slightly lower than that of Hospital #1 but above the other hospitals. Peer hospitals have considerably lower cost per test. Hospital #2 costs would be expected to be higher due to the esoteric nature of the testing. Both Hospital #1 and the NHS send testing to the private sector providers.

Tests Per FTE Per Day



The value for NHS is 53 tests per FTE per day. This number is slightly higher than Hospital #1 but lower than peer Hospital #4. Hospitals #1, 3 and 4 testing patterns would be very similar to NHS and the tests per FTE are also similar.

Cost Per FTE Per Day



Laboratory Costs Per Procedure

The table indicates the basis for estimating cost per procedure/test. The analysis provides the foundation for critically analyzing expenditures, especially as they relate to the relative value of having tests preformed at various sites.

NHS 2003/04 Laboratory Cost Per Procedure						
Function	SCG	HDH	GNG	WHS	DMH	PCG
Staff -Medical	$ 1.09	$ 1.32	$ 1.49	$ 1.67	$ 0.60	$ 0.54
Staff - Technical/Clerical	$ 3.45	$ 5.26	$ 3.79	$ 4.18	$ 5.15	$ 4.48
Purchased and Contracted Services	$ 8.14	$ 0.63	$ 0.51	$ 0.80	$ 1.64	$ 1.07
Equipment and Supplies	$ 1.23	$ 1.52	$ 0.95	$ 1.48	$ 1.77	$ 1.75
Net Totals	**$ 13.91**	**$ 8.74**	**$ 6.76**	**$ 8.13**	**$ 9.17**	**$ 7.85**

LABORATORY SERVICES

The HDH, SCG, GNG and the WHS are all operating 24 hours per day, 7 days per week. The DMH and the PCG are staffed two shifts per day with on call services in during the night. Testing is not provided at NTL or SRH.

Microbiology is referred out of the region to MDS.

Esoteric testing is also referred out to the PHL, Sick Kids, MDS or Hamilton Health Sciences Centre.

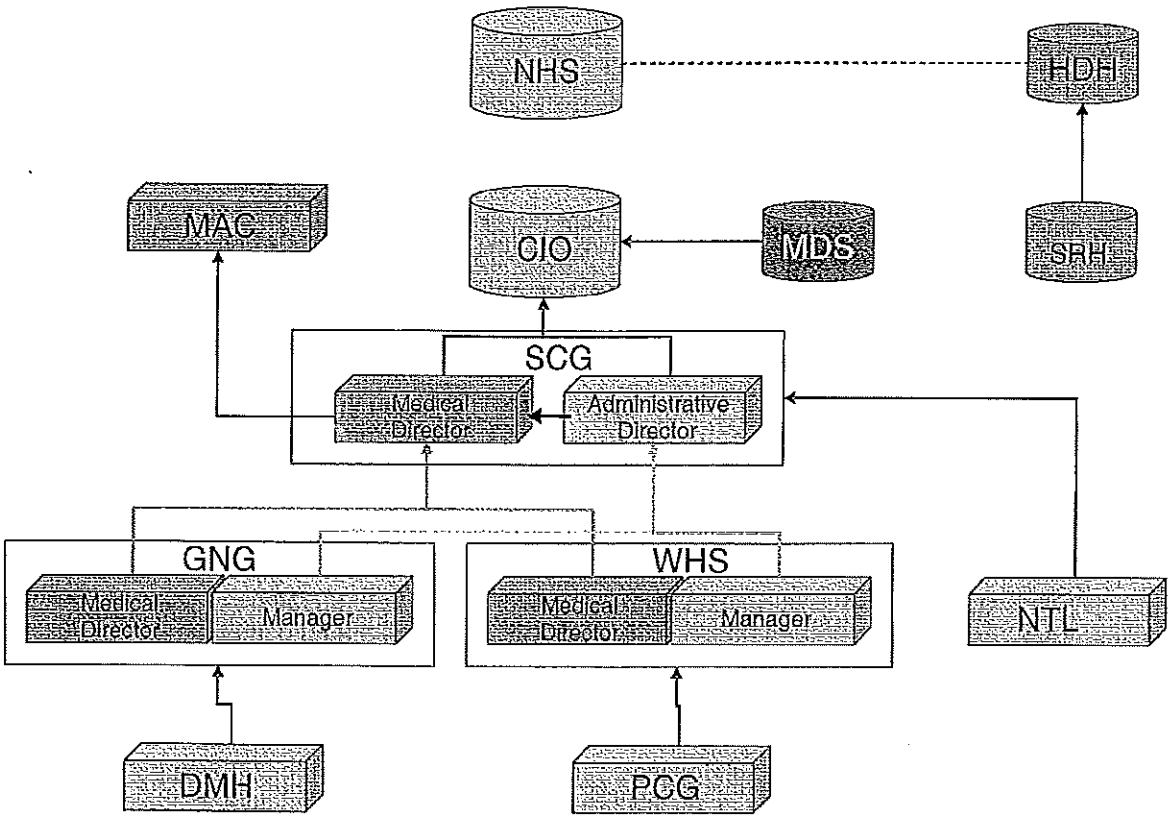
HUMAN RESOURCES

Technical staffing is comprised of Medical Laboratory Technicians and Medical Laboratory Assistants. Medical typists also provide clerical support to clinicians (i.e., transcribe anatomical pathologists reports, etc.) and administrative support where required. An appropriate complement of administrative staff is available to conduct duties such as reception, filing, typing, appointment scheduling and other related tasks.

The Laboratory Administrative Team consists of the Regional Medical Director, Site Medical Directors, Regional Director of Operations (MDS employee) and two site Mangers (MDS employees). The team provides management, regional coordination and support specific to the delivery of laboratory services across the NHS.

III. KEY RECOMMENDATIONS

ORGANIZATIONAL STRUCTURE



SERVICE DELIVERY MODEL

The current service delivery model can be described as "distributed" with significant test menus at some of the smaller locations. The consultant proposes to introduce a full "hub and spoke" approach, decreasing the test type and volume at several of the smaller locations and enhancing the central "hub" laboratory at the SCG. Tests will also be relocated "upstream" from the DMH to the GNG and from the PCG to the WHS and redirected from NTL to SCG.

Testing

At the DMH, the consultant proposes to take advantage of its proximity to the GNG (approximately a 20 minute drive) to decant several tests now performed onsite to the GNG. Only phlebotomy and STAT testing will remain onsite.

The following tests will be transported to GNG:

Code	Name	Volume
L006	Ethyl alcohol	22
L068	Creatinine clearance	1
L073	Drug Testing	26
L078	Drugs of abuse screen	105
L378	Bone Marrow	1
		155

To take further advantage of a full hub and spoke model, the following tests will be relocated from the GNG upstream to the SCG:

Code	Name	Volume
L001	Acetone qualitative (should be quantitative)	15
L004	Albumin qualitative	49
L040	Carbamazepine	162
L055	Cholesterol total	850
L068	Creatinine clearance	18
L073	Drug testing	345
L078	Drugs of abuse screen	539
L085	Electrophoresis	173
L117	High-density Lipoprotein	659
L139	Total Iron	261
L172	Methemoglobin	71
L243	Triglycerides	829
L304	Aminoglycosides	136
L319	Hepatitis	474
L321	Theophylline	29
L324	Dilantin	284
L329	Ferritin	636
L339	Free T4	223
L341	TSH	1810
L343	Phenobarbitone	34
L377	Bleeding time	36
L378	Bone Marrow	27
L379	Bone Marrow staining	27
L667	Non-cultural direct bacterial antibody	134
L668	Heterophile antibody screens	93
		7914

At the PCG, the consultant proposes to take advantage of its very close proximity to the WHS (approximately a ten minute drive) to decant several tests now performed onsite to the WHS. Only phlebotomy and STAT testing will remain onsite.

The following tests will be transported to WHS:

Code	Name	Volume
L078	Drugs of abuse screen	90
L306	Digoxin	229
L378	Bone Marrow	2
L494	Blood group per antigen	245
L661	Cold agglutinins-titre	0
		566

To take further advantage of a full hub and spoke model, the following tests will be relocated from the WHS upstream to the SCG:

Code	Name	Volume
L040	Carbamazepine	190
L055	Cholesterol total	185
L068	Creatinine clearance	57
L073	Drug testing	0
L078	Drugs of abuse screen	779
L190	Phosphatase acid	66
L243	Triglycerides	159
L304	Aminoglycosides	132
L321	Theophylline	21
L324	Dilantin	377
L337	Bleeding time	12
L343	Phenobarbitone	123
L378	Bone Marrow	17
L379	Bone Marrow staining	85
L660	Cold agglutinins-screens	10
L661	Cold agglutinins-titre.	6
		2219

Test Menu Changes at SCG

The changes indicated above will increase the volume of testing in the St. Catharines hub laboratory. In addition, a detailed analysis of the current referred-out test menu indicates that a substantial volume of tests are currently referred out to the private-sector provider that are more appropriately conducted onsite. These low-cost, high volume tests can be run on existing instrumentation using laboratory staff currently in the NHS system. The following table indicates tests and volumes currently undertaken by the private-sector provider to be performed by SCG:

Code	Name	Volume
L005A	Albumin Quantitative	756
L018A	Amylase	93
L00A	Bilirubin, Total	1214
L031A	Bilirubin, conjugated	11
L040A	Carbamazepine Quant	79
L045A	Calcium	511
L046A	Calcium Ionized	73
L053A	Chloride	6199
L055A	Cholesterol Total	3611
L061A	CO2 Content	4181
L066A	Creatine Phosphokinase	821
L067A	Creatinine	6793
L068A	Creatinine Clearance	64
L107A	GGTP	561
L111A	Glucose Quantitative	6347
L117A	HDL Chol	3055
L139A	Iron TIBC	484
L146A	LDH	582
L157A	Lithium	58
L165A	Magnesium	206
L181A	Occult Blood	727
L191A	Phosphatase Alkaline	1962
L194A	Phosphorus	329
L204A	Potassium	6256
L208A	Protein Total	448
L222A	SGOT AST	3316
L223A	SGPT ALT	1649
L226A	Sodium	6243
L242A	Triglycerides	3621
L251A	Urea Nitrogen	3007
L252A	Uric Acid	1107
L253A	Urinalysis	1480
L254A	Urinalysis Micro	1136
L257A	Valproic Acid	185
L304A	Aminoglycosides	72
L306A	Digoxin	164
L309A	Folate, SR & RBC	1563
L419A	Hepatitis	4502
L324A	Dilantin	167
L329A	Ferritin	1322
L339A	Free T4	1182
L341A	TSH	4934
L372A	Blood Film (WBC)	126
L375A	Blood Film Special Stain	2
L393A	CBC	7764
L398A	Reticulocyte Count	77
L402A	Fibrinogen, Quantitative	11
L406A	Fibrin	14
L432A	Malaria Smear	2

Code	Name	Volume
L445A	Prothrombin time	4815
L451A	Sedimentation Rate	802
L452A	Sickle Cell Prep	3
L462A	Partial Thromboplastin	213
M10PA	PSA	1857
		96712

The closure of the laboratory at the HDH has by far the biggest impact on the hub laboratory at SCG. Presuming that the pattern of clinical practice remains the same at SCG as it was at HDH, the following HDH test volumes will move to SCG:

ode:	Name	Volume
L655	Pregnancy	939
L668	Heterophile antibodies -screen	144
L374	Blood film buffy coat prep	2
L377	Bleeding time	84
L378	Bone Marrow	302
L379	Bone marrow staining	302
L391	CSF cell count	34
L393	CBC	38600
L398	Reticulocyte count	670
L406	Fibrin split products latex screen	720
L424	Hemosiderin	1
L432	Malaria smear	5
L445	Prothrombin time	19512
L451	Sedimentation rate	8756
L462	PTT	7222
L471	Antibody identification	103
L482	Antibody screen	2881
L490	Blood Group	4163
L492	Crossmatch	5626
L493	Blood Group - phenotype	569
L494	Blood Group per antigen	835
L495	Direct anti-human globulin	120
L001	Acetone	722
L005	Albumin quant	5975
L006	Ethyl alcohol	880
L018	Amylase	1495
L030	Bilirubin total	8105
L031	Bilirubin conjugated	465
L035	pCO2, pOw and pH in comb.	3800
L045	Calcium	6195
L053	Chloride	29557
L055	Cholesterol total	178
L059	Acetaminophen	588
L061	CO2 content	27022
L066	Creatine Phosphokinase	2507

ode	Name	Volume
L067	Creatinine	27171
L068	Creatinine clearance	180
L070	Creatine Phosphokinase fractionation	80
L078	Drugs of abuse screen	284
L107	Gamma glutamyl transpeptidase	4919
L111	Glucose, quant	18072
L112	Glucose, semi-quant	21569
L139	Iron	544
L146	LDH total	5129
L150	Lipase	1760
L165	Magnesium	1180
L181	Occult Blood	240
L191	Phosphatase, alkaline	8666
L194	Phosphorus	4951
L197	PBG screen	0
L204	Potassium	30056
L208	Protein	3805
L221	Salicylate	772
L222	SGOT	9276
L223	SGPT	5761
L226	Sodium	29761
L243	Triglycerides	172
L251	BUN	29574
L252	Uric acid	3665
L253	Urinalysis	5917
L254	Urinalysis microscopic	2536
L267	Urobilin quant	0
U097	PSA	1506
U116	Troponin	6237
L304	Aminoglycosides	178
L306	Digoxin	1115
L319	Hepatitis	2423
L321	Aminophylline	21
L324	Diphanythydantoin quant	248
L329	Ferritin	3432
L341	TSH	1210
L343	Phenobarbitone	64
L345	Vitamin B12	0
L720	Surgical pathology (Blocks)	10700
L721	Consult (frozen section)	54
L731	Immunoperoxidase	439
L705	Aspiration biopsy	160
L706	Bronchial washings	29
L708	Gastric washings	1
L710	Direct smears	11
L711	Fluids	2850
L713	Cervicovaginal specimen	6

ode	Name	Volume
L715	Smear for eosinophils	0
L716	Sputum	34
		420781

The net effect of moving some tests upstream from the "spoke" hospital laboratories, others downstream from the current private sector provider and assuming all HDH tests move to SCG is to increase test volumes at the SCG hub laboratory by 528,347. This doubles the current size of the laboratory, and creates considerable opportunity for economy of scale.

Staffing

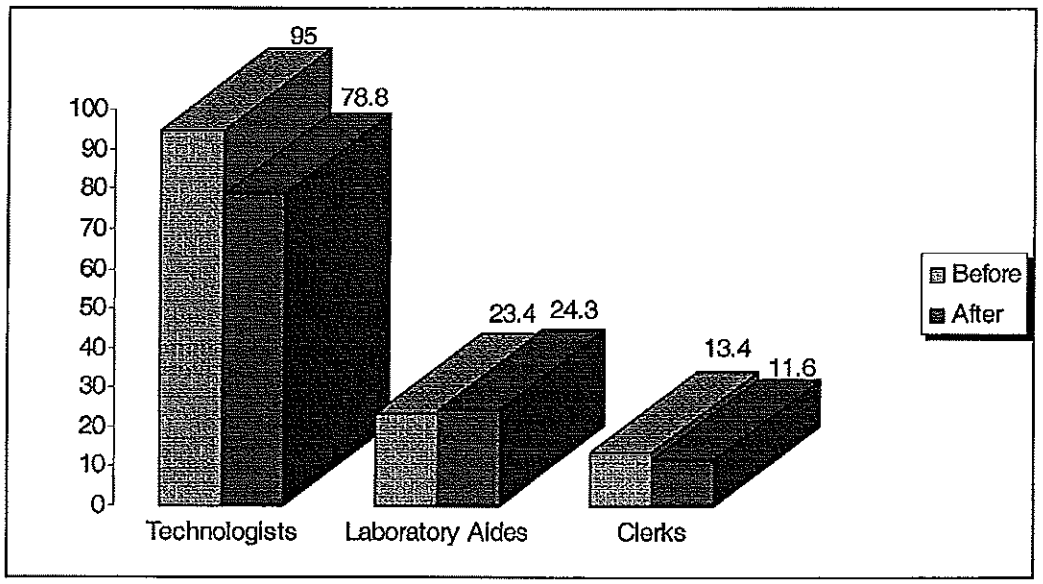
The following table indicates the proposed "before and after" staffing levels for each laboratory in the Niagara Health System:

Site	Staffing	Before	After	Change
Niagara on the Lake				
	Technologists	0	0	0
	Laboratory Aides	1.1	1.1	0
	Clerks	0	0	0
Port Colborne General				
	Technologists	5.1	3	-2.1
	Laboratory Aides	2.2	2	-0.2
	Clerks	0	0	0
Douglas Memorial Hospital				
	Technologists	5.1	3	-2.1
	Laboratory Aides	0.9	2	1.1
	Clerks	0.3	0	-0.3
Welland Hospital				
	Technologists	16.3	16.3	0
	Laboratory Aides	3.1	3.1	0
	Clerks	3.3	3.3	0
Greater Niagara General				
	Technologists	18.5	18.5	0
	Laboratory Aides	6.6	6.6	0
	Clerks	4.2	4.2	0
Hotel Dieu Hospital				
	Technologists	21.2	0	-21.2
	Laboratory Aides	2.5	2.5	0
	Clerks	2.5	0	-2.5
St. Catharines General				
	Technologists	28.8	38	9.2
	Laboratory Aides	7	7	0
	Clerks	3.1	4.1	1

SCG STAFFING MODEL		
	Current	Proposed
Core Lab	17.7	25.7
Histology	5.6	6.6
Cytology	0.6	1.6
Surgical Autopsy	1.1	1.1
Phlebotomy	7	7
Admin Clerical	3.1	4
Regional	2.4	2.4
Other	0.7	0.7
TOTAL	**38.2**	**49.1**

The ratio of technologists to laboratory aides is approximately 3:1 throughout the system. In St. Catharines in the future it will be closer to 5.5:1. Some U.S. laboratory systems attempt to achieve a 1:1 ratio of technologists to laboratory aides. This would be a considerable risk for the NHS as the overall number of available technical staff is so low. There is, however, an opportunity in the future in the St. Catharine's core lab to address the projected imbalance through staff attrition and retirement.

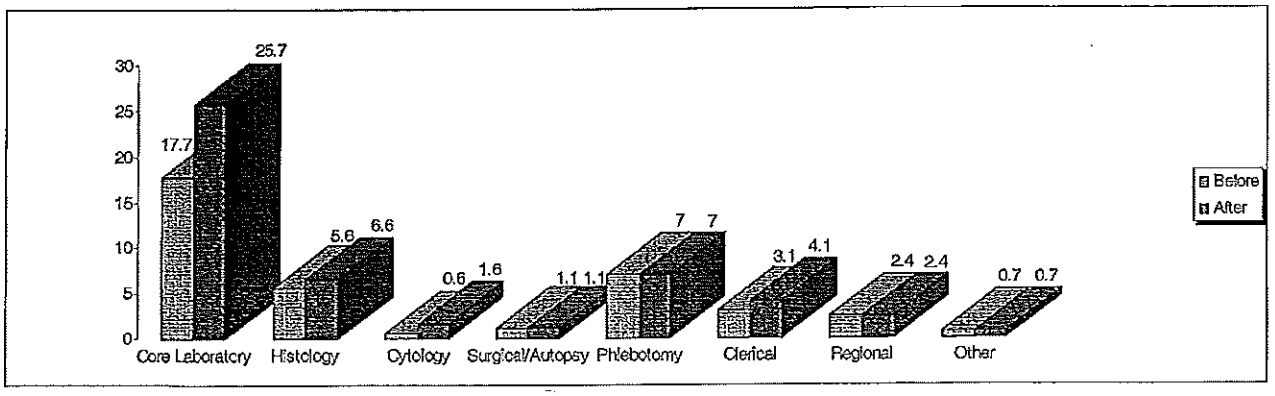
The overall system staffing impact is indicated in the following graph:



The following table indicates the cost changes associated with this overall staffing impact:

Overall System Impact		Cost	Change
Technologists	-16.2	$65,000	$(1,053,000)
Laboratory Aides	0.9	$35,000	$ 31,500
Clerks	-1.8	$35,000	$ (63,000)
Total	**-17.1**		**$(1,084,500)**

The principal changes in the system are at the SCG hub laboratory. The consultant proposes the following changes to staffing levels at SCG:



Equipment and Reagents

A review of equipment occurred within the NHS. There has been a great deal of activity as the region is working on purchasing laboratory equipment under the DME funding. This will result in further equipment standardization. Other than replacing the aging chemistry equipment in the region, all other equipment is relatively new and standardized.

Costs for the introduction of a new blood bank gel system need to be added in PCG, GNG, WHS and SCG. HDH currently has a system that can be transferred and used elsewhere. The equipment costs for this procedure are minimal but the cost increase for the test is about $2.00 per test. The test volume is about 15,000 ABO Rh tests per year. HDH does about 6,000 procedures and this can then be transferred to the SCG. This must be implemented to standardize within the region and insures that that NHS can meet the accreditation standards. (Equipment from HDH can be reused into the NHS.)

A review of the histopathology area at GNG determined that there is a very urgent need for an appropriate anatomical pathology grossing station with approved ventilation. Air monitoring was not performed but the fumes generated by this laboratory are very excessive and posses a health risk for the staff. A modern grossing station with good ventilation is recommended. Consider transferring grossing station from HDH (if it is transportable) to GNG when testing is moved to SCG. As well an automatic slide stainer is required for the SCG.

PHYSICIAN PLANNING

	Surgical Volumes	Cytology Volumes	Total Volumes
Hotel Dieu Hospital	11,192	3091	14,283
St. Catharines General	39,487	2170	41,657
Greater Niagara General	21,202	671	21,873
Welland Hospital	15,550	325	15,875
Total	87,431	6257	93,688

The above tables show the current status of the available physicians in the region and also the total funded positions that have either not been filled or are in the process of being recruited.

The transfer of these pathologists into the NHS will greatly reduce the considerable workload on the current physicians.

In the industry, there is a great deal of debate on what volume of work a pathologist should perform during the average workday. There are many factors that come into play. They include the complexity of the specimens, the body site from which the specimens were taken and if the laboratory supports a cancer program. Teaching and research activities also impact on the pathologist's productivity. The NHS does not undertake either teaching or research. This will lead to an increase in time available for service activities and therefore an increase in procedures/consultations per pathologist. Despite this, the current volume of activities undertaken by pathologists in the region is considerably higher than that undertaken in any comparable North American system.

This issue is being considered by the OMA and it is expected that performance targets will be agreed within a year. The workload at the NHS will likely far exceed the levels acceptable to the OMA. It is the consultant's recommendation that assistance be provided to the Medical Director to encourage the recruitment of pathologists to the NHS. It is also recommended that the NHS work with adjacent regions to review the probability of a physician collaborative that would offer support (financially and clinically) as needed to the pathologists within the NHS.

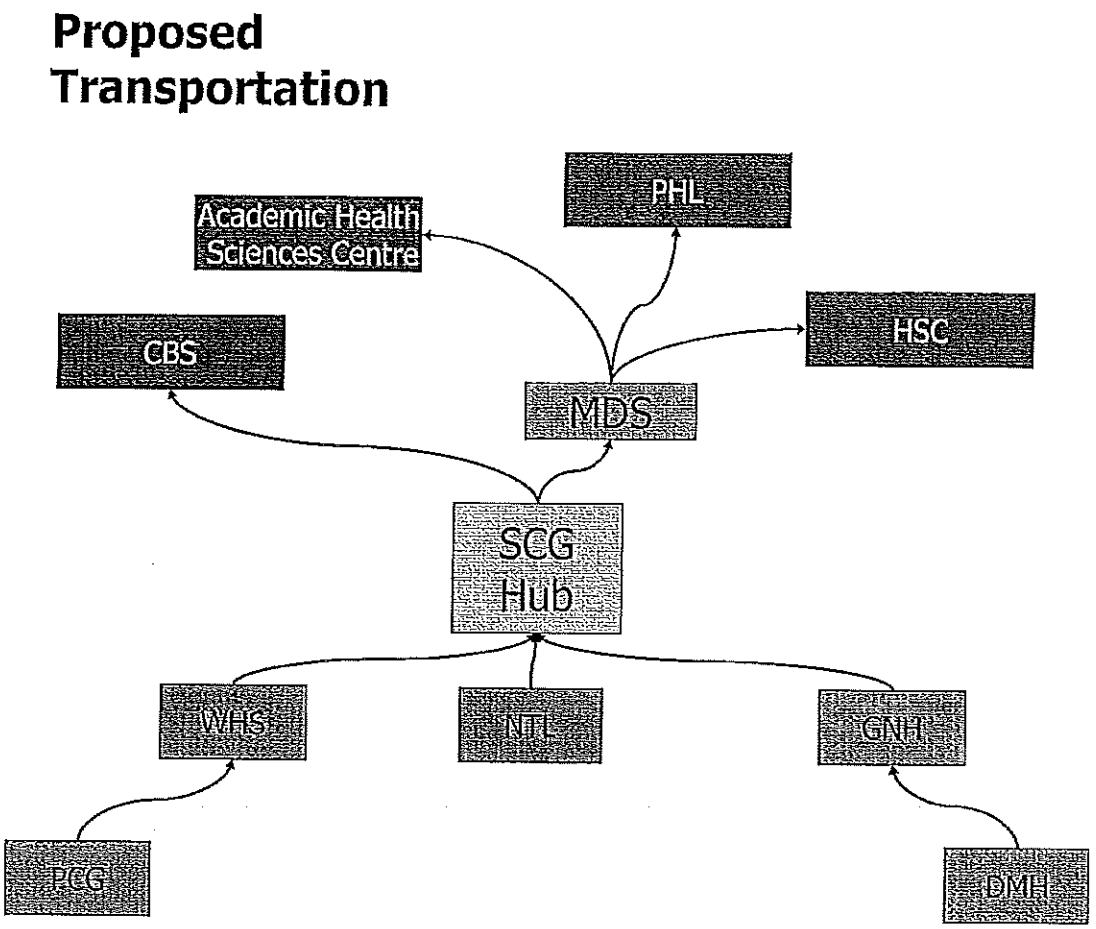
DEVELOPMENT OF LINKAGES AND AREAS OF REQUIRED SUPPORT

It is important the NHS maintain linkages to an Academic Health Science Centre. This offers a variety of supports that the NHS cannot obtain without this connection. They include:

- Access to new technologies and best practices
- Translation from Research to clinical relevance
- Support in problem solving of complex technical and medical problems
- Back up support for Medical and Technical crisis's.

Transport (Hub and Spoke)

The transportation flow will be streamlined to align with the new testing and site approach as follows:



BUDGET

There are several contributors to the new budget:

Cost Reductions

- An overall reduction in the staffing costs of $1,084,500
- An overall reduction in the costs of equipment and reagents of $300,000
- Removal of the purchased service costs of $200,000

- Cost reduction of moving costs to and restructuring referred out costs for a savings of $132,008.
- Removal of the NTL referred out testing. This can be covered under the SCG testing costs. Savings of $165,125.
- Decrease in reagent costs at PCG of $200,000

New Costs

- One Laboratory Operations Director
- One Manager
- Operating costs associated with the system of $45,000.

The Laboratory is a very capital and technologically intense area of healthcare. It is advisable to plan for continual updating and investment into new technologies and equipment.

The recommendations provide a background to development of an implementation plan. This plan will likely cover several years as the programs are moved within the NHS.

COMPARATIVE IMPACT

The following graphs illustrate the impact of these measures in comparative terms: