Database Design for Sentinel Lymph Node Dissection of Breast Cancer

by

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Acknowlegement

This report has been written by me and has not received any previous academic credit at this or any other institution.

I would like to thank Sandra Cook, my supervisor in Cancer Care Nova Scotia, who directly supervised and coordinated this project, and Maureen MacIntyre and Ron Dewar for advising on this project. I am also greatly appreciated for the medical expertise from Drs. Geoff Porter, Carmen Giacomantonio and Penny Barnes, and for the valuable advices on medical terminology and data coding from Grace Paterson, Karen Starrett and Gwen Warner. I would also like to thank for the technical support given by my fellow student Manhui Li. Finally I would like to thank Cancer Care Nova Scotia for the support given to this internship project.

Summary:

This 13-week internship project in Cancer Cancer Nova Scotia was aimed to design a database to collect information of sentinel lymph node dissection (SLND) for the credentialing of physicians who are interested to provide this service for their breast cancer patients across Nova Scotia. The data elements that would be collected were determined with the help of surgeons and pathologists from QEII Health Sciences Center after the investigation of the clinical work routine and data flow. A data model was established for the design of a relational database using Microsoft Access 2003. A table scheme based on the underlying data model was defined and also a user-friendly form was designed to facilitate the data entry by physicians who perform SLND. As the credentialing process requires, a report format was designed with the desired parameters for credentialing automatically calculated based on the data provided by each physician. Two ongoing issues, the housing and security of the database, are still being discussed for optimal solutions. This internship was a typical informatics project that applied principles and tools of database management to solve a health care problem. The end product is a relational database to monitor the quality of a health care service, namely sentinel lymph node dissection, for breast cancer patients. This project also provides a model with great utility for Cancer Care Nova Scotia to ensure quality care provided to cancer patients.

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1 Introduction

Breast cancer is the most commonly diagnosed cancer and the second leading cause of death due to cancer among women in Canada. In 2005, there are approximately 21,600 new cases of breast cancer, in which about 5,300 will die of it. In Canada, the lifetime probability of women developing breast cancer is 1 in 9, and the lifetime probability of women dying of breast cancer is 1 in 27[1]. The earlier the breast cancer is detected, the better chance of the recovery. Breast cancer screening program for women at risk has significantly improved the survival rate of breast cancer patient. Among treatments of breast cancer, surgery remains to be the mainstay after an operable breast cancer is diagnosed. Combinations of surgery, chemotherapy, radiotherapy or hormonal therapy have greatly improved the survival of breast cancer patients. Proper selection of treatments warrants benefit to the greatest extent to a breast cancer patient.

Cancer stage refers to the extent or severity of the cancer at diagnosis after reviewing information from a variety of sources including physical examinations, laboratory tests, x-rays, pathology and surgery reports. Staging information is critical for oncologists to select the appropriate treatment based on the best evidence. It also facilitates researchers to stratify cancer cases for comparison across institutions to study the outcome of cancer care.

The most common staging system used in North America is TNM. The T in TNM denotes the tumor itself, providing information of tumor size and cancer cell type. The N indicates whether any lymph nodes are involved near the tumor. The M refers to the metastasis to the other part of the body. Numbers are used to combine with letters to show the extent, the higher the number, the more extensive the disease. Collaborating staging provides more detailed information than TNM staging. It not only provides detailed information of primary site tumor, lymph nodes and distant metastasis, but also provides information from specific diagnostic tests, for instance, ER and PR status for breast cancer, which is a very important determinant of sensitivity to hormonal treatment.

Even though ALND is still regarded as the standard staging procedure of the nodal status of the patient after diagnosis of breast cancer, the morbidity of ALND is significant after the procedure, including wound infection, neural damage and lymphedema of the involved arm. SLND is picking momentum in the last few years due to its accuracy and low morbidity as well as the accumulated evidence provided by clinical trials of its equivalent local recurrence rate to that of ALND. However, SLND is a procedure that has a learning curve and also involves close co-operation of surgery, nuclear medicine and pathology. Figure 1 shows the learning curve of SLND[2]. In most of the institutions, surgeons are the driving force to initiate the practice of SLND, and therefore it starts with surgeon's training and credentialing. Credentialing qualified physicians to perform SLND is critical to standardize the practice and provide quality health care to breast care patients. The Steering Committee on Clinical Practice recommended a clinic practice guideline for care and treatment of breast cancer on SLND[3]. Regarding the training and credentialing of physicians, the guideline recommends:

- Patients should be informed of the number of SLN biopsies performed by the surgeon and the surgeon's success rate with the procedure, as determined by the identification of the SLN and the false-negative rate.
- Before surgeons replace axillary dissection by SLN biopsy as the staging procedure at their institution, they should (a) familiarize themselves with the literature on the topic and the techniques needed to perform the procedure, (b) follow a defined protocol for all 3 aspects of the procedure (nuclear medicine, surgery, pathology) and (c) perform backup axillary dissection until an acceptable success rate is achieved.
- A surgeon who performs breast cancer surgery infrequently should not perform SLN biopsy.

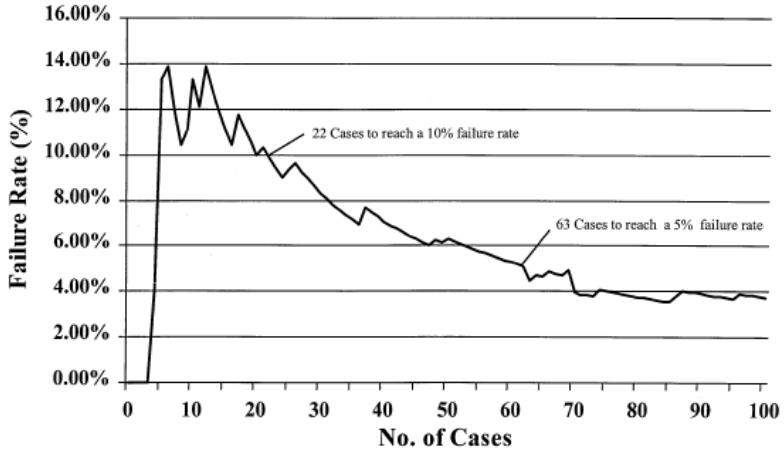

Figure 1. Lymphatic mapping learning curve: Mean of Moffitt surgeons A-F.

A workshop of sentinel lymph node dissection, sponsored by Cancer Care Nova Scotia, was held in April 2005. It raised the question of credentialing physicians if the procedure were to be practiced widely across Nova Scotia. It was decided that a database be established to help credentialing physicians in the short term and monitor the quality of practice in the long term. This project was aimed to design a relational database using Microsoft Access to collect SLND data relevant to physician credentialing across Nova Scotia.

2 Cancer Care Nova Scotia

Cancer Care Nova Scotia (CCNS) is a program of the Nova Scotia Department of Health. The program was established in 1998 to improve cancer services, education and research for all Nova Scotians. It covers cancer prevention, screening, education, treatment, follow-up care and palliation[4].

Nova Scotia Cancer Registry (NSCR) operated by Surveillance and Epidemiology Unit (SEU) under Cancer Care Nova Scotia is responsible for the data holding. NSCR data is collected to support Nova Scotia based cancer control activities including production of descriptive cancer statistics at a provincial level, submission of Nova Scotia cancer statistics to Statistics Canada, monitoring and evaluation of various aspects of cancer system performance, provision of information for cancer program planning, education of system stakeholders and generation of

new knowledge through research directed at cancer related issues. NSCR has no internal data sources. There are several external sources of data collection including pathology reports, neoplasm report forms primarily submitted by hospital health records departments, cancer center cases, vital statistics and special studies such as cases identified by researchers but not already reported by other external sources.

Since 1991, Oncology Patient Information System (OPIS) is the information system used for registry operations. Since the information systems is facing the upgrading or replacement issues, Cancer Registry decided that the database that I would design in this project be a standalone database in Microsoft Access, but with a universal identifier to link to the OPIS information system.

3 Breast cancer staging

As mentioned above in the introduction, cancer staging provides crucial information for oncologists to decide on future treatment plans for a breast cancer patient.

3.1 Clinical staging

It includes physical examination with palpation of the skin, mammary gland, and lymph nodes (axillary, supraclavicular, and cervical), imaging, and pathologic examination of the breast or other tissues as appropriate to establish the diagnosis of breast carcinoma. The extent of tissue examined pathologically for clinical staging is not so great as that required for pathologic staging.

3.2 Pathologic staging

It includes all data used for clinical staging, plus data from surgical exploration and resection as well as pathologic examination of the primary carcinoma, regional lymph nodes, and metastatic sites (if applicable), including not less than excision of the primary carcinoma with no

macroscopic tumor in any margin of resection by pathologic examination[5].

3.3 TNM Classification

3.3.1 Primary tumor

The clinical measurement of the primary tumor (T) is usually from the physical examination or imaging such as mammography or ultrasound. The pathologic tumor size for the T classification is measurement of only the invasive component. The size of the primary tumor is measured for T classification before any tissue is removed for special studies. Paget's disease with a demonstrable mass anywhere within that breast or an invasive component is classified according to the size of the tumor mass or invasive component.

3.3.1.1 Microinvasion of breast carcinoma

It is the extension of cancer cells beyond the basement membrane into the adjacent tissues with no focus more than 0.1cm in greatest dimension. When there are multiple foci, the size of only the largest focus is used to classify the microinvasion.

3.3.1.2 Multiple simultaneous ipsilateral primary carcinomas

Tumors are defined as arising independently only if they occur in different quadrants of the breast. The largest primary carcinoma to designate T classification.

3.3.1.3 Simultaneous bilateral breast carcinomas

Each carcinoma is staged as a separate primary carcinoma in a separate organ.

3.3.2 Regional lymph nodes (N)

3.3.2.1 Micrometastasis

Micrometastasis are defined as tumor deposits greater than 0.2mm but not greater than 2.0mm in largerst dimension that may have histologic evidence of malignant activity. Cases with only micrometastasis detected are staged as pN1mi(i+).

3.3.2.2 Isolated tumor cells (ITCs)

ITCs are defined as single cells or small clusters of cells not greater than 0.2 mm in largest dimension, usually with no histologic evidence (such as proliferation or stromal reaction). Lymph nodes with IHCs are staged as pN0(i+).

3.3.2.3 RT-PCR

Histologically and IHC negative lymph nodes with evidience of metastasis using molecular methods (RT-PCR) are staged as pN0(mol+).

3.3.3 Distant metastasis (M)

Tumor cells may be disseminated either by lymphatic channels or by blood vessels. Distant metastases frequently involve the bone, lungs, brain and liver as well as other distant sites.

4 Sentinel Lymph Node Dissection (SLND)

4.1 Lymphatic Mapping in Breast Cancer

The current standard of the management of invasive breast cancer is the complete removal of the tumor and documentation of negative margin by either lumpectomy or mastectomy followed by complete axillary node dissection[6]. It has been controversial whether complete axillary node

dissection has any curative benefit for breast cancer patients with negative nodal status. SLNB may eliminate this controversy by identifying which patient has positive nodal status and hence needs complete axillary node dissection.

The rationale to practice SLNB is based on lymphatic mapping for breast cancer. The concept of lymphatic mapping for breast cancer was transplanted from lymphatic mapping for melanoma, which hypothesizes that lymphatic drainage from specific areas of breast tissue to the regional lymph nodes is an orderly and definable process. Sentinel lymph nodes are the nodes that first receive lymphatic drainage from the tumor and therefore the nodes most likely to harbor tumor cells. Injections of blue dye, Tc99 labeled colloid or both are the techniques used for lymphatic mapping. Patients injected with Tc99 colloid will have a lymphoscintigraphy scan before operation to help localize the sentinel lymph nodes. Sentinel lymph nodes will be identified hot with a monitor in operation if Tc99 colloid is injected. Blue dye injection helps the surgeon to trace along blue stained lymphatics to the blue stained sentinel nodes. The regional lymph nodes draining breast tissue are classified into two major groups: axillary nodal group and internal mammary nodal group. There is a small portion of patients with lateral breast cancer draining across midline to internal mammary nodes. Therefore, lymphatic mapping is critical for surgeons to accurately identify the sentinel nodes in operation and dissect them for pathologic studies.

4.2 Pathologic Studies for Sentinel Lymph Nodes

For most cancers, nodal status is the most important prognostic indicator and determines the plan of treatment. SLND uses blue dye injection, Tc99 labeled colloid or both to identify the sentinel lymph nodes dissected for pathologic studies. Hence a standardized pathologic protocol to examine sentinel lymph nodes dissected is critical for the identification of nodal metastases in breast cancer patients. **A** standard protocol has been established for pathologic evaluation of sentinel lymph nodes in breast cancer (Appendix 1)[7].

5 Description of the clinical data related to SLND

5.1 Primary tumor

5.1.1 Laterality

Breast tumor mass can be either palpable or impalpable during pre-op physical examination. Impalpable mass can be identified with imaging diagnostics, ie. Mammography, ultrasound. Primary breast cancer laterality is determined in pre-op assessment by either physical exam or imaging studies. There are cases that the patient has bilateral breast carcinomas simultaneously.

5.1.2 Site of the primary tumor

For single unilateral breast carcinoma, site as upper-outer quadrant (UOQ) can overlap with axillary tail of breast. Surgeons don’t usually differentiate breast carcinomas at the axillary tail from those at UOQ clearly.

For unilateral multiple breast carcinomas identified only in pathology, site of the largest breast carcinoma is recorded. SLND is contraindicated for patients with palpable multiple breast carcinomas.

For simultaneous bilateral breast carcinomas, each tumor is counted as independent. The site of each tumor is recorded separately.

5.1.3 Tumor size

Tumor size is measured accurately in pathological studies. There can be multiple tumor masses in one breast. Cases with palpable ipsilateral multiple tumors are contraindicated for SLND. However, there are occasions that only one tumor is palpable or detected with imaging studies before operation while multiples tumors are identified with pathology. Conservatively, tumors are defined as arising independently only if they occur in different quadrants of the breast.

The size of the largest tumor is recorded if there are multiple simultaneous ipsilateral primary carcinomas identified in pathological examination. Cases as such are to be recorded as the outcome should be analyzed separately.

5.1.4 Tumor differentiation

The Nottingham combined histologic grade (Elston-Ellis modification of Scarff-Bloom-Richardson grading system) is used. The grade for a tumor is determined by assessing morphologic features (tubule formation, nuclear pleomorphism, and mitotic count), assigning a value of 1 (favorable) to 3 (unfavorable) for each feature, and adding together the scores for all these categories. A combined score of 3-5 points is designated as grade 1 (well differentiated); a combined score of 6-7 points is grade 2 (moderate differentiated); a combined score of 8-9 points is grade 3 (poor differentiated).

5.1.5 Management of the primary tumor

In the same occasion of SLND, management of the primary tumor can be either lumpectomy or mastectomy. Lumpectomy is an equivalent to wide excision in a patient’s operation record.

5.2 SLN localization technique

SLN may be localized by the injection of radioactive tracer and/or blue dye. They may be injected into the peritumoral, periareolar or subareolar tissue intradermally or subdermally.

5.2.1 Blue dye injection

The blue dye injected right before the surgery can be Lymphazurin blue or methylene blue. The injection site can be peritumoral or periareolar/subareolar.

5.2.2 Tc99 injection

The radioactive tracer used is Tc99 labelled sulphur colloid, filtered or unfiltered, or Tc99 labelled albumin. The injection time of the Tc99 could be the day before the surgery or the morning of the day of surgery. Patients with palpable tumors are injected in the Department of Nuclear Medicine around the periphery of the tumor. Patients with impalpable tumors undergo mammography or ultrasound for localization to guide the injection.

5.2.3 Pre-op lymphoscintigraphy

Lymphoscintigraphy is the effort to identify the lymph nodes that have afferent drainage from the tumor after injection of Tc99 labelled sulfur colloid. The breast cancer patient is imaged immediately after the injection and the regions of interest are the axilla, clavicular and internal mammary nodes. SLNs can be spot by imaging immediately after the injection in approximately 60% cases. Delayed imaging is necessary to detect SLNs in the remainder of cases.

5.3 Intra-op identification of SLN

SLNs can be identified by either the blue coloration or gamma count or both of the lymph nodes. Information about how each SLN is identified intra-operatively should be documented separately.

5.4 Site of harvested SLN and non-SLN

Nodal basins that may harbor SLNs are axillary, internal mammary and clavicular regions. Occasionally in-transit intramammary SLNs can be spot and dissected. Non-SLNs sometimes are dissected along with SLNs due to their anatomic closeness to the SLNs identified. Site where each SLNs and non-SLNs is recorded as axiallry, internal mammary, supra- or infra-clavicular.

5.5 Intra-op pathologic evaluation

Intra-op pathologic evaluation includes frozen section, touch prep (also called imprint cytology) or both. SLNs with a measurement of 5mm or less in the maximum dimension are bisectioned and those greater than 5mm in diameter are serially sectioned at 2mm intervals to maximize the surface area for touch prep. The non-SLNs are usually only bisectioned for touch prep if not grossly suspicious. The pathologic diagnoses for intra-op evaluation are positive, negative or atypical when cells of undetermined origin or rare suspicious cells are identified.

5.6 Routine pathologic assessment

After the intra-op evaluation, the dissected lymph nodes are submitted and processed for routine histopathological examination with H&E stain. Any SLNs that are grossly and intra-operatively negative for metastasis are immunohistochemically (IHC) stained with a cytokeratin monoclonal antibody. to detect micrometastasis and isolated tumor cells. The pathologic diagnoses for routine evaluation are positive, negative and micrometastasis.

5.7 Micrometastasis

Micrometastasis is defined as tumor cells groups greater than 0.2mm and not greater than 2mm. Lymph nodes with only micrometastasis are staged as pN1. They can be detected by H&E stain only, IHC only or both.

5.8 Isolated tumor cells (ITCs)

ITCs are defined as tumor cell groups less then 0.2mm in size. Lymph nodes with only ITCs are staged as pN0. For most of the time, they can only be detected by IHC. However, they can also be detected by routine H&E stain.

5.9 Subsequent ALND

Subsequent ALND is performed in the same occasion as SLND if intra-op evaluation of SLNs is positive. ALND will be performed in a separate surgery if routine pathologic evaluation of SLNs is positive while the intra-op evaluation is either negative or atypical. Besides the SLNs and non-SLNs dissected in SLND, the number of positive LNs and the number of LNs dissected in both procedures should be recorded.

6 Database Design for Sentinel Lymph Node Dissection

6.1 Determine the data collection

To satisfy the information needs for credentialing physician and monitoring the practice, the data that should be collected in this database were decided after literature review and discussions with Dr. Geoff Porter and Dr. Carmen Giacomantonio from Department of Surgery, and Dr. Penelope Barnes from Department of Pathology in QEII Health Sciences Center. These data elements were categorized into four groups: general information, data of primary tumor, data of SLND and data of ALND (see Appendix 2).

Among data collected as general information, the health care NO of patient is used as the universal identifier of each patient in the database. The OPIS NO assigned to the patient if registered in OPIS Information System and hospital chart NO if hospitalized when SLND was performed are also recorded to facilitate the identification of a patient if she may have more than one health card NO.

The name of the surgeon who performed SLND and the name of the pathologist who examined the SLNs dissected are also recorded. It is especially important to capture the name of the surgeon since final data analysis will be done for each surgeon to determine his/her qualification.

Information of SLND includes data collected about the SLN localization technique, the identification and dissection in surgery and pathologic data of each lymph node dissected in SLND. Data collected about ALND used as a golden standard that SLND compares to decide the parameters mentioned above. The current practice guidelines of SLND in Canada recommend that ALND always be a backup for any surgeon that is in the process of credentialing. For credentialed surgeons, ALND should be performed if SLND has a positive pathology [2].

6.2 Design the data model and table scheme

An Entity-Relational diagram (ERD) for this SLND database was established as the data model (Appendix 3). Three major problems required particular consideration when SLND data model was being designed:

- Occasionally there are patients with simultaneous bilateral breast carcinoma. There is the possibility that the patient has SLND on both sides at the same time;
- Some patients may have breast carcinoma on one side and has SLND on this side, and then develop breast carcinoma on the other side years leter and has another SLND on the side;
- Pathology data of each lymph node dissected in SLND should be collected and recorded.

For patients with simultaneous bilateral breast carcinomas, both the health card NO and laterality data of the tumor are used as primary key to differentiate each SLND that has been performed. Therefore, two records of SLND will be collected in Table SLND and two cases are counted as performed by the surgeon for only one patient.

For patients with bilateral breast carcinomas developed at different dates, the data field named as SLNDdate in Table SLND is used to store the data when SLND is performed. In this case, the same patient should have two SLNDs performed at different dates compared to same date for simultaneous bilateral tumors.

For each lymph node dissected, either sentinel node or non-sentinel node, an ID is given to

differentiate them with each other. A set of pathology data will be captured for each lymph node dissected. This design allows a high level of detailed information is collected for each lymph node dissected, especially sentinel lymph nodes, in SLND.

The table scheme of SLND database was defined based on the ERD established (Appendix 4).

6.3 Design the data entry form

The surgeons agreed to enter the data into the database after they are sure that the pathology reports have been received. Hence it is important to design a user-friendly interface to facilitate the data entry. A data entry form was designed using the tools provided by Microsoft Access. See Appendix 5 for the data entry form.

6.4 Design the report for credentialing

Adequate evaluation of the SLND program is imperative to guarantee the quality of clinical practice. It is best to establish a common vocabulary that describes the outcome parameters of interest [7]. The parameters could be used to appraise literature and compare results across different institutions on a common basis. These outcome parameters include the following:

- **Success rate:** the ability to locate SLN in all basins identified by preoperative lymphoscintigraphy. Because of longer learning curve for breast cancer, this rate should be above 90% within the first 20-30 cases.
- **Yield:** number of sentinel nodes biopsied per patient.
- **Positivity:** percentage of patients who will have lymph node metastases identified by SLN pathologic examination.
- **Sensitivity/False negative rate:** the ability of SLN biopsy to identify all patients with lymphatic metastases. (100 = Sensitivity + false negative rate).
- **Exclusivity:** the incidence of patients whose only nodal metastases are in SLN.

- **Local failure rate:** incidence of nodal metastases occurring after negative SLN biopsy of that lymphatic basin.

The five parameters mentioned above as the success rate, false negative rate, yield, positivity and exclusivity will be automatically calculated on the data from each surgeon and then reported for viewing and printing as shown in Appendix 6.

The formulae that have been used to calculate the parameters mentioned above are listed as following:

$$\text{Success rate} = \frac{\text{Number of patient with SLN dissected}}{\text{Number of patients with attempted SLND}}$$

$$\text{Yield} = \frac{\text{Sum of SLNs dissected from all patients}}{\text{Number of patient with SLN dissected}}$$

$$\text{False negative rate} = \frac{\text{Number of patient with negative SLND and positive ALND}}{\text{Number of patient with positive ALND or positive SLND}}$$

$$\text{Positity} = \frac{\text{Number of patient with positive SLND}}{\text{Number of patient with SLN dissected}}$$

$$\text{Exclusivity} = \frac{\text{Number of patient with positive SLN and no positive non-SLN}}{\text{Number of patient with either positive SLN or positive non-SLN}}$$

The success rate and false negative rate are two of the most important parameters for credentialing. In order to be credentialed, a surgeon has to achieve a success rate over 90% and a false negative rate less than 5%.

6.5 Data dictionary for SLND database

A data dictionary was made using the standard format applied by Cancer Registry. It provides a definition of each data field in the tables at the back-end of the SLND database. The complete data dictionary was attached in Appendix 7. It will serve as a reference for the database administrator.

7 Relation to health informatics

This project applied the principles of database design that I have learned from Professor Mike Shepherd course “Networks and Web for Health Informatics”. It also involved the knowledge of clinical data flow and use that I acquired form Dr. David Zitner’s course “Flow and Use”. In order to transform the data model into a usable relational database, I taught myself of Microsoft Access 2003 and VBA programming.

This project also requires a medical knowledge of oncology, surgery and pathology, especially in the first stage when I investigated the process of routine workflow and clinical data collection. Communications with surgeons and pathologists are critical for the completion of this project. One of my tasks was to help the physicians who would perform the data entry to understand the basics behind the database so they can handle the work without difficulty. Their feedback was also important for me to decide how to make the user interface more friendly. These experiences dictated the role of a health informatician not only as a technologist but also as a good liaison between health care practitioners and computer scientists.

8 Ongoing issues

8.1 Housing the database

The SLND database is considered of being housed on a server since it will be used by physicians who are interested in providing SLND service to their breast cancer patients across Nova Scotia. The portal used for cancer navigation has been suggested one of the options as where to house the database. If this option has been proved feasible, Cancer Care Nova Scotia will be responsible for the administration of the SLND database. The user physicians each will be assigned an account to be able to log on for data entry. Data will be regularly reviewed and reported by Dr. Geoff Porter and Dr. Carmen Giacomantonio for the credentialing of physicians

in Nova Scotia.

8.2 Security of the database

Security issue of the database is crucial to guarantee the privacy and confidentiality of the medical data stored in this database if the database is going to be housed on the intranet of Cancer Care Nova Scotia. The security issue will be discussed in the meeting with the network administrator and a solution will be developed to secure the database.

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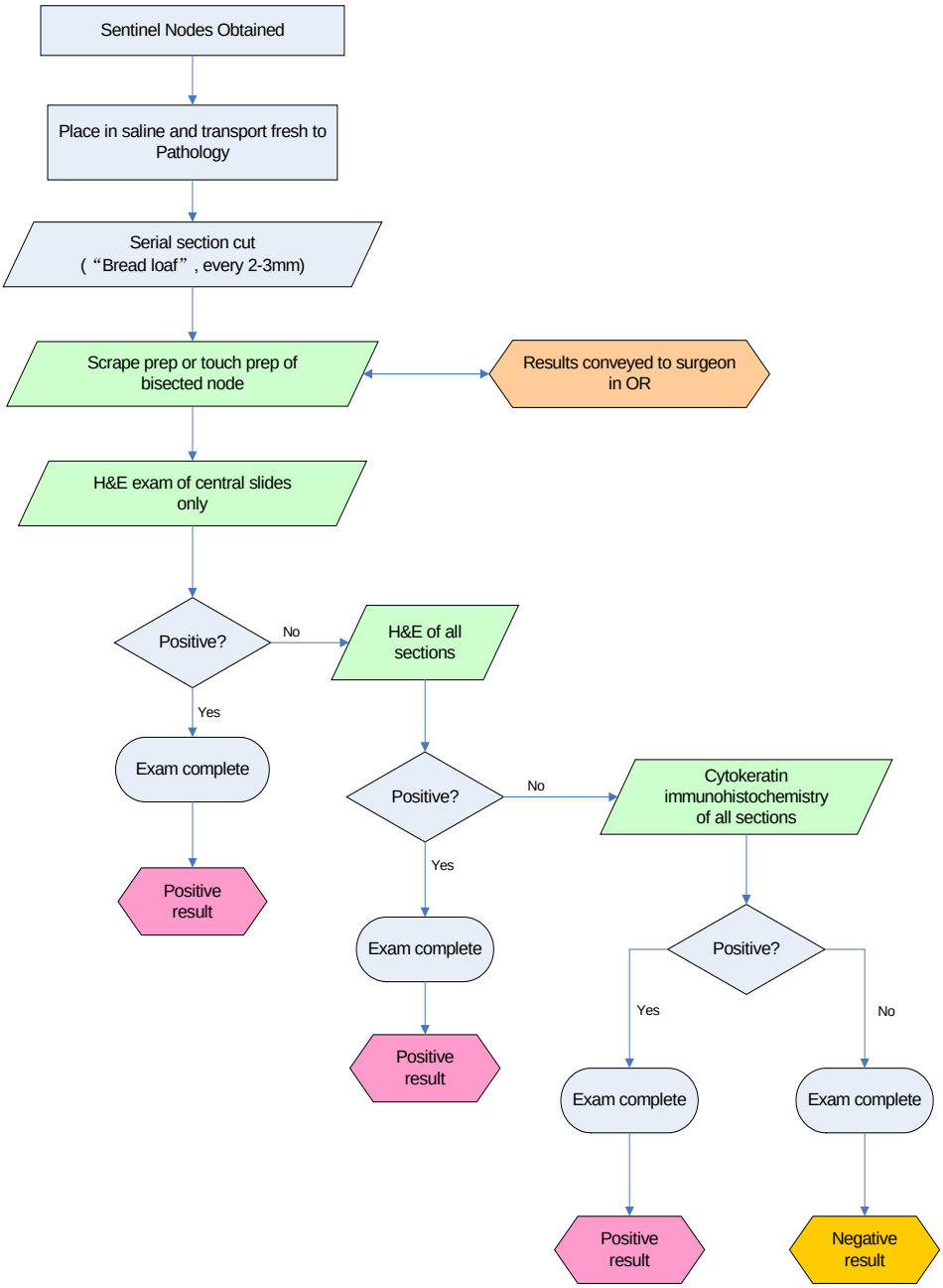
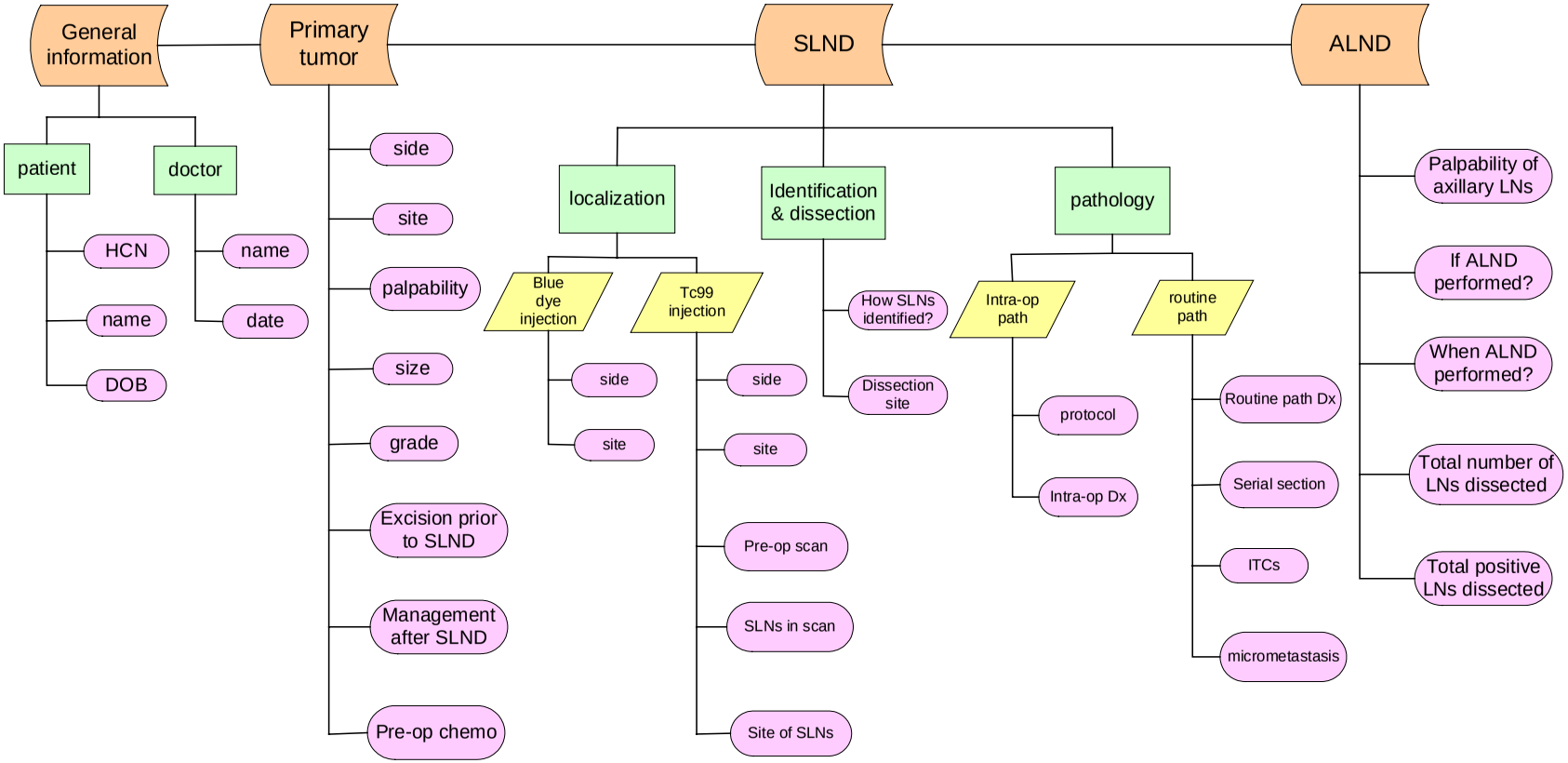
Appendix 1

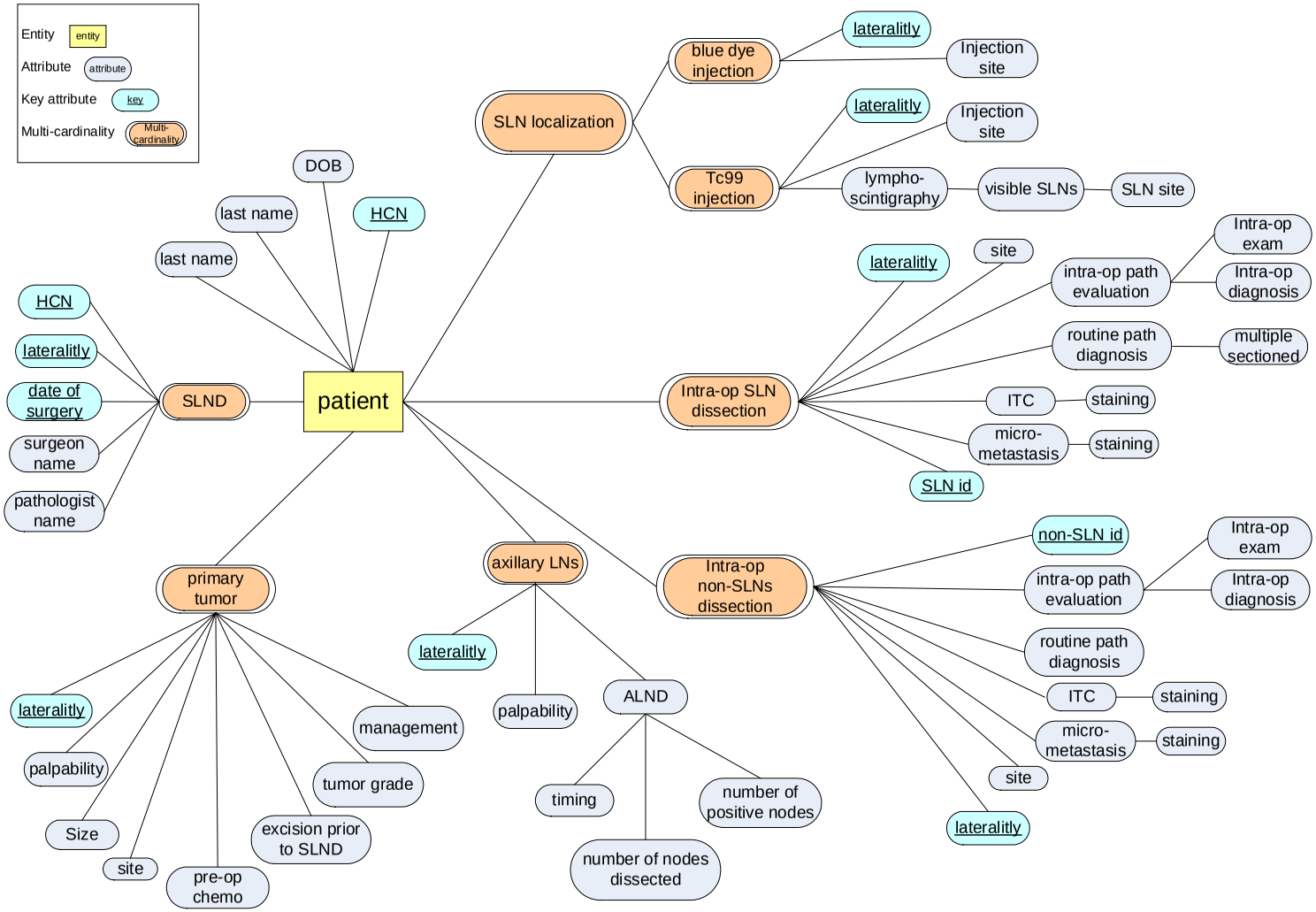
Standard protocol for pathologic evaluation of sentinel lymph nodes in breast cancer



Appendix 2 Data Structure of SLND Database



Appendix 3 Entity-Relation Diagram of SLND Database

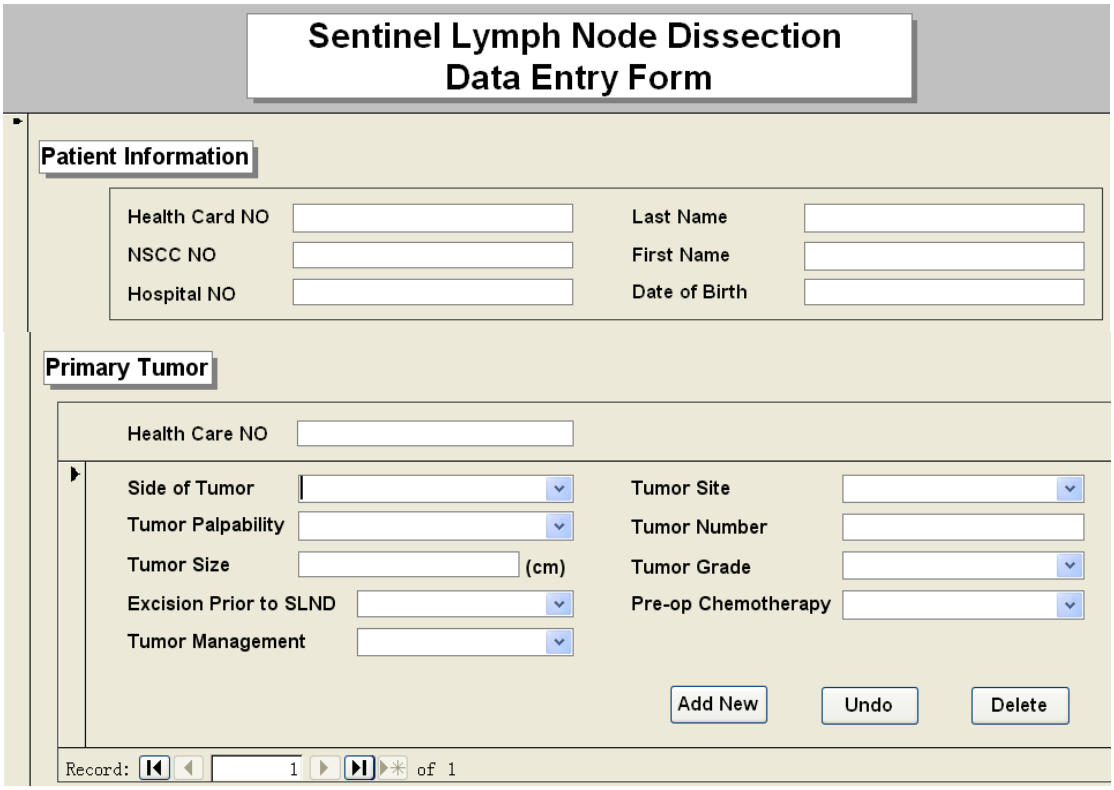


Appendix 4

Table scheme of SLND database:

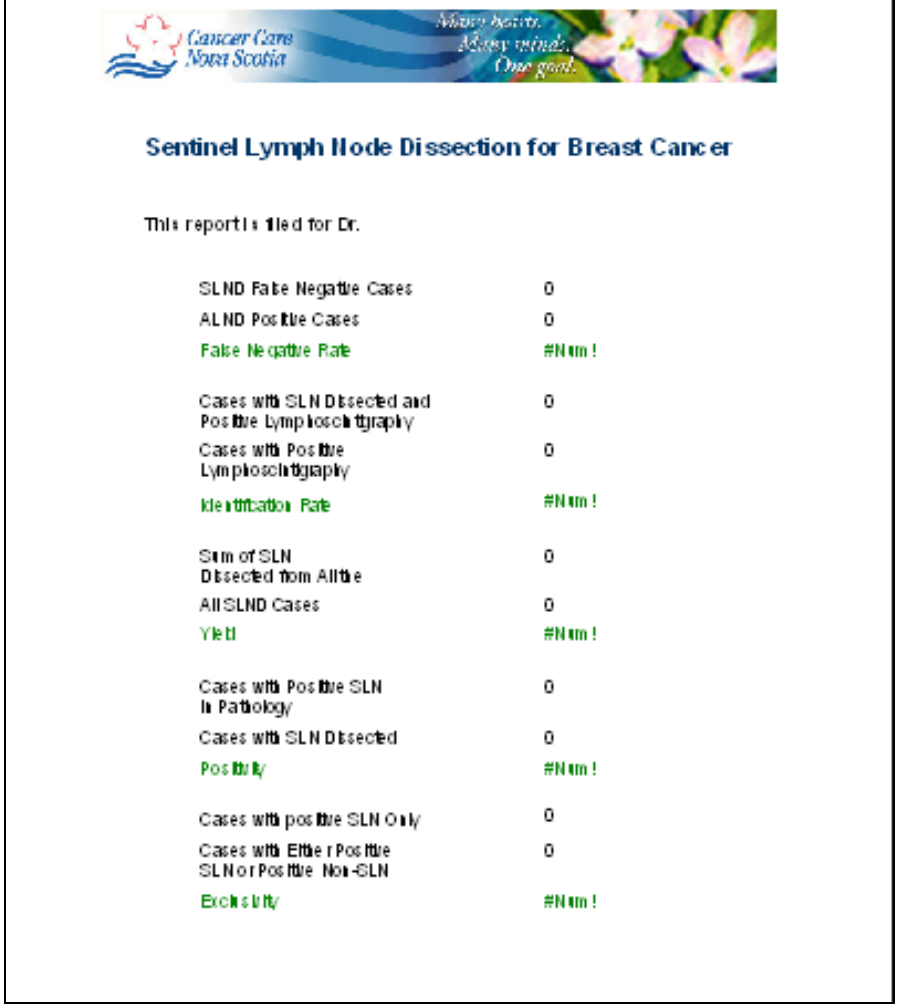
- Patient (HCN, LastName, FirstName, DOB)
- SLND (HCN, SLNDdate, SLNDside, Surgeon, Pathologist)
- TumorLN (HCN, TumorSide, TumorPalpab, TumorSite, TumorExcisPriorToSLND, TumorSize, TumorGrade, PreopChemo, TumorMngmt)
- Injection (HCN, InjectSide, BlueDyeInjectSite, Tc99 InjectSite, Scinti, ScintiSLN, ScintiSite)
- SLN (HCN, SLNDside, SLNid, SLNlocalizat, DissecSite, IntraopPath, IntraopDx, RoutineDx, MultiSect, MicroMx, ITC)
- NonSLN (HCN, SLNDside, NonSLNid, DissecSite, IntraopPath, IntraopDx, RoutineDx, MicroMx, ITC)
- ALND (HCN, ALNDside, AxilPalpab, ALND, NumPositLN, NumDissecLN)

Appendix 5


Sentinel Lymph Node Dissection
Data Entry Form
Patient Information
Health Card NO
NSCC NO
Hospital NO
Last Name
First Name
Date of Birth
Primary Tumor
Health Care NO
Side of Tumor
Tumor Palpability
Tumor Size
(cm)
Excision Prior to SLND
Tumor Management
Tumor Site
Tumor Number
Tumor Grade
Pre-op Chemotherapy
Add New
Undo
Delete
Record:
1
of 1

Appendix 6

Report:



Appendix 7

Data dictionary for SLND database