Toward Excellence as the Standard for Medical Practice

Variation in Documentation and Surgeons' Opinion in the Breast Clinic

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Abstract

Recently, there has been a growing movement toward an Electronic Health Record (EHR) to improve quality of care. The paper-based medical record is still the primary source of information in today's medical practice. In order to design the EHR, knowledge with regard to the current medium of documentation is required.

In the MUHC Cedars Breast Clinic, 112 medical records for 7 surgeons were audited to determine what was recorded in the initial visits between year 2002 and 2003. A Likert scale questionnaire was developed and included 46 questions derived from the chart review. It was introduced to assess their opinions on important variables in managing breast patients. The correlation between the medical records and surgeons' opinions was then sought.

The majority of data points had a low rate of documentation with wide variation; breast cancer risk factors were recorded in less than one third of charts. Family history and physical examinations had relatively high rates of documentation. The survey showed a considerable variation among surgeons' opinions. Surgeons reported that they addressed 63% of all data points (29 of 46 questions) *very often/always*. There was weak correlation between what each surgeon records and what he/she thinks is important.

Résumé

Récemment, il y a eu un mouvement grandissant vers le dossier électronique de santé (EHR) pour améliorer la qualité du soin. Le dossier médical sur papier est toujours la source primaire d'information dans la pratique en matière, aujourd'hui. Afin de concevoir EHR, la connaissance en ce qui concerne le milieu courant de la documentation est exigée.

Dans la Clinique du sein de l'Institut des cèdres du CUSM, 112 disques médicaux pour 7 chirurgiens ont été apurés pour déterminer ce qui est enregistré dans les visites initiales en l'année 2002 et l'année 2003. Un questionnaire de balance de Likert comprenant 46 questions dérivées des dossiers a été présenté pour évaluer leur avis sur des variables importantes dans les patients de gestion de sein. La corrélation entre ces deux a été cherchée.

La majorité de points de repères a eu un bas taux de documentation avec une grande variation; des facteurs de risque de cancer de sein ont été enregistrés dans moins d'un tiers de dossiers. Les antécédents familiaux et les examens physiques ont eu des taux relativement élevés de documentation. L'aperçu a montré une variation considérable parmi l'opinion des chirurgiens. Les chirurgiens ont rapporté qu'ils ont adressé 63% de points de repères (29 de 46 questions) *très souvent/toujours*. Il y avait corrélation faible entre ce que chaque chirurgien enregistre et quel il/elle pense est important.

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1. Introduction

High quality is the principal objective of patient care. Providing health care service is an information-dependent process and, therefore, effective information management is critical to the practice of medicine. Information management consists of: how we record, process, retrieve, and communicate information. The medical record serves as a basis for information management. Despite many technological advances in health care over the past few decades, the traditional paper-based medical record of today is similar to the patient record of 50 years ago. [1] It has been shown that it can be faulty, containing distorted, deleted and misleading information.[2] Hence, the current status of medical record is not sufficient to fulfill the needs for high quality care.

An electronic health record (EHR) is a prospective way to compensate these shortages and to improve information management in medicine.[3] Electronic health systems can improve health care delivery by providing medical professionals with easier data entry, better data access, faster data retrieval, complete accurate data, and more flexibility in data display. In addition, the support system can provide alerts, reminders and aid in clinical decisions (i.e. smart record).

In order to replace the current paper documentation with the electronic record, an in-depth understanding of current documentation to recognize its weaknesses and replicate its strengths is required. This knowledge would address two issues: 1) identify the current documentation practice and physicians' perception (needs assessment) and 2) determine principles to design EHR to meet these needs.

At present, health system does not have enough knowledge about current practice and physicians' preference. The simplest and most readily available method to determine the current pattern of practice is medical chart review. It can explore the physicians' preferences and priorities. However, because of the deficiencies of the paper-medical record (such as errors and idiosyncrasies in the

reading, interpreting, coding, and transcribing of data), it is possible that the current documentation does not reflect their perception about documentation. Therefore, any investigation in medical documentation would not be complete unless the physicians' perception is explored as well. One should examine what physicians think is "important" and then determine how much of this thought process is reflected in the medical documentation. This task can be done by a self-report survey (questionnaire).

The result of this study can function as a very basic skeleton upon which an electronic health record can be built. It can aid to create a useful and pertinent system to accommodate physicians' clinical preference in their daily practice. It can facilitate to create an individual based EHR that will contain the data points that surgeons actually record in their daily practice. The prospective features, therefore, will seem familiar to them, making physicians more comfortable using the electronic system. In addition, physicians would be encouraged to adopt and take advantage of up-to-date and evidence-based medicine.

2. Literature review

Medical record

Although the world of medicine seems to be changing and progressing with each day, one thing that has not changed is the need for good documentation. Nothing can take the place of an accurate account of the patient's care in the medical record and it becomes an integral part of patient care responsibility and should be treated as such.[4] Maintaining high quality medical records is clearly an essential part of good clinical practice; they are needed not only for good clinical communication, but also to build a clear picture required for appropriate diagnosis and treatment. Traditionally, patient records have been paper-based and have been used to store patient care data. In the 1880s, physicians at the Mayo Clinic in Minnesota kept all their patients' records in a personal leather-bound ledger. This was replaced, in 1907, with individualized patient-based files, and this method of record-keeping is still used today.[5]

The medical record is a repository of historical information about the reasons for visits to physicians, the clinical course of symptoms and disease, the findings of tests and examinations and the outcomes of interventions.[6] Medical records serve many functions in the modern healthcare environment. These can be broadly divided into *primary* and *secondary* functions. [7,8,9] A primary patient record is used by health care professionals while providing patient care services to review patient data or document their own observations, actions, or instructions. A secondary patient record is derived from the primary record and contains selected data elements to aid non-clinical users (i.e., persons not involved in direct patient care) in supporting, evaluating, or advancing patient care and research (Table 1).

Why we still have a paper-based medical record?

The paper record is still regarded as the first and most accurate source of information for both clinical and medico-legal decision-making. There are a number of reasons why paper remains the prevailing tool for record-keeping. The strength of paper based systems lies in their usability without special equipment or training to acquire new skills or behaviors to use them. Any sighted person with the proper linguistic and technical background can read and understand (except indecipherable handwriting) a paper-based record without any special equipment. Paper can support graphical representation of data as well as text, allowing for emphasis of particularly important points in an intuitive way.[10] It allows flexibility in recording data and is able to record "soft" (i.e. subjective)[11] data easily. Paper records are portable and can be carried to the point of care.

Medical record deficiencies

The paper based medical record has been extensively criticized. Burnum [12] stated that "medical records, which have long been faulty, contain more distorted, deleted and misleading information than ever before". Data can be missing for at least three reasons: (1) questions were never asked, examinations were never performed, or tests were never ordered;(2) the information was requested and provided, but either it was not recorded by the clinician or delays occurred in placing the information in the record; and (3) the information was requested and delivered but was misplaced or lost.[12] Therefore, replacement of this old system with a sophisticated and efficient Information Technology (IT) application is a need.

The Electronic health record (EHR)

The need to improve the management of medical information has been a pivotal driving force stimulating the development of IT applications in medicine. Although the use of IT in medicine is in its infantile stages, the development and dissemination of computer applications is occurring at an ever-increasing rate.[1] EHR is an electronically maintained (computerized) patient record system with point-of-care tools that support clinical care. EHR has been a promising tool for better patient care by offering a way to efficiently improve and monitor the processes and outcomes of care.[13] The fact that the patient data in the EHR are stored in digital format makes possible a number of potential features, including (1) rapid, simultaneous access to the patient record by multiple users, (2) on-line data processing for automating clinical and administrative processes, (3) on-line information processing for clinical and administrative decision support and (4) integrated access to data from multiple and disparate data sources.[14] It also provides accessibility to complete and accurate data, alerts, reminders, clinical decision support systems (smart record). For example, the risk of developing an invasive breast cancer over the next five years and the lifetime probability of developing breast cancer can be calculated using the Gail Model. This model takes into account five factors including the current age, age of menarche, previous breast biopsies, age at first live birth and family history of breast cancer in first-degree relatives.[15]Then physicians can objectively estimate the relative risk of cancer and, for high risk patients, can modify their management and follow-up accordingly.

How an Electronic Health Record (EHR) should be designed?

Designing an ideal EHR should be focused on the development of a technically sophisticated and applicable electronic record which is able to meet a variety of

demands of the health care system. Any electronic system which hopes to replace primarily paper-based systems must replicate the strengths while addressing the weaknesses of traditional paper-based medical record.

Difficulties in implementation of EHR

It has been shown that physicians have been reluctant users of EHR.[16,17,18,19] The single greatest challenge that has consistently confronted every clinical system developer is to get clinicians to use direct data entry.[20] The limitations of how data can be entered, and how physician entry of those data may inadvertently inhibit patient care.[24]

In mid 80's, a project by the Canadian University Hospital was initiated to completely replace the paper patient record. The objective was to design, develop, and implement a computerized medical record in four participating hospitals. At the time, the entire project was intended to take place over a 3-year period (1987-1990). However, the project encountered serious delays in the development and implementation stages and a second grant was obtained to keep it going. The second phase took place between 1991 and 1996. Both the nursing and medical personnel were then asked to use the new system. Finally after several months of various attempts, the computerized system had to be withdrawn because of boycotts from both the medical and nursing personnel. It resulted in information overload and standardization, task load increase, work organization rigidification, and expert autonomy negation. Information overload was a strong deterrent for physicians in their inclination to use the system. The potential for the computerized patient record to increase workload was one of the main fears expressed by the physicians. Their case-load of inpatient practice is usually very heavy so that small increases in clerical activities represented a heavy burden.[21]

Cedars-Sinai Medical Center in Los Angeles turned off its computerized physician order entry system (Patient Care Expert (PCX)) in January 2003, after hundreds of physicians complained that rather than speeding up and improving patient care, it actually slowed down the process of filling their orders. The fact that entering orders by computer was taking physicians longer than their accustomed paper medical record. Physicians complained that the electronic system was poorly designed, endangering patient safety (because orders weren't being transmitted or were getting lost) and required too much work. One reason was that the hospital failed to sufficiently involve physicians in the design and implementation process.[22]

Physicians perform their data entry during the patient encounter. What will result is a scenario of two competing interfaces: physician-computer and physician-patient. The paper record suffers little from interference because handwriting is such an automatic activity, and the paper itself blends almost seamlessly into the physician-patient interface -- there is only one interface. The use of computers in the intimate world of the physician-patient encounter, however, can be extremely intrusive and needs critical evaluation. Computers tend to represent a competing interface. They also tend to inhibit the asking of facilitating questions, sensitive reflection, the logic of the diagnostic process, eye contact and the sense of personal attention that comes with it, or the formation of the physician-patient relationship. The goal of the paperless EHR is not simply what we want it to do, but how it can contribute to our overall goal: the quality of patient care. When the EHR impairs the quality of documentation and that of the physician-patient relationship, an invaluable tool turns into a dismal failure.[23]

Advocates of health care computerization may suggest that the problems identified by end-users may evaporate when the technology improves. This is a fond hope that assumes that such problems are essentially technical rather than social and cultural in nature, but it seems that even the most sophisticated technology will fail in the absence of clear appreciation of the needs, perceptions and experiences of end-users.[24]

Therefore, computerizing medical records without assessing the potential limitations and needs in clinical practice will be more problematic and eventually will not help the health system to improve its quality of care. Physicians should support this process in order to bring it successfully to conclusion. So until the perfect EHR arrives, installing a system will require not only computer knowledge but human engineering skills as well -- to bridge the physician gap. Anyone installing a system, be it at a hospital or medical practice, must enlist the opinion of all physicians if this important technology can ever be expected to reach its potential.[25]

How to determine the pattern of current documentation?

Medical chart review

Medical chart review is relatively inexpensive, reasonably reliable, and able to adequately control for case-mix variation.[26,27] It has been the most common method of measuring quality, which includes both the competence of the clinician and what the clinician actually records.[28,29,30] It allows the determination of the strengths and weaknesses of documentation. It also makes it possible to compare the practice over time among practitioners and among health care centers, make judgments and set priorities for quality enhancement. This method has been primarily validated in the inpatient setting, where care tends to be extensively documented and clinical events are more temporally circumscribed. As care has increasingly shifted to the outpatient setting, so has reliance on abstraction of outpatient charts to measure quality of care.[31] Breast care has particular characteristics that make chart review an appropriate means of quality of care assessment. In breast care as an outpatient setting, history and examination are performed as part of an evaluation and management which may be reflected in documentation.

Yet, medical chart review has been extensively criticized. It does not include all aspects of the multidimensional issue of patient care. It has been shown that

there are errors and idiosyncrasies in the reading, interpreting, coding, and transcribing of data. In medical record documentation, little is known about how accurately it reflects the patients' clinical condition. Even less is understood about what influences the accuracy of the provider's documentation and whether patient characteristics influence documentation habits.[32] Some studies showed that the medical record abstraction does not completely reflect the accuracy of quality of care delivered. It also may underestimate the actual performance of clinicians and other indicators of quality care.[33,34,35] One reason is that medical records are informal diaries of observations, impressions, and hunches. They contain mostly verbal descriptions of people and events, and translation of these verbal descriptions into hard, quantitative data is fraught with error.[36,37,38] Most comparisons have shown a major discrepancy between the desires of physicians and what actually happens.[39,40,41,42] Therefore, the distinction between what physicians think and what they actually record in their patient's encounter is necessary. In order to show the probable disagreement between the physicians' perceptions and documentation in the medical chart, any medical chart review should be combined with an investigation on surgeons' attitudes and self-reported behaviors which would be a guide to understand and improve the quality of documentation.

3. Objectives

This study was carried out to determine the current pattern of documentation and assess the needs of prospective electronic system users.

The specific objectives of the thesis are:

1. To determine what data are recorded in the patients' medical charts in the breast clinic (i.e. questions are asked, physical signs are elicited and the frequency of each).
2. To determine the variation among surgeons' documentation.
3. To assess surgeons' opinion about which data points are important in breast care.
4. To determine the correlation between "what surgeons record" in their charts and "what they think is important".

4. Subjects and Methods

A retrospective chart review of 112 patients managed in the Cedars Breast Clinic was undertaken. Data was collected from patients' initial visits for seven (7) attending surgeons (16 for each surgeon) working in the Clinic between 2002 and 2003. We reviewed outpatients' medical charts to determine surgeons' documentation pattern during the patients' encounters. The choice of initial visit in the past calendar year was made to ensure that there was no influence due to a previous encounter. It was assumed that any awareness of the prior diagnosis and treatment might change the documentation in terms of the questions that would be asked and procedures that might be undertaken. Therefore, we did not include the follow-up cases.

Charts were selected by consecutive sampling after stratifying for benign vs. malignant. Fifty percent of the charts for each surgeon were for patients with cancer as the diagnosis and the other half had benign breast diseases. Patients' pathology reports were used to determine whether the diagnosis was benign or cancer. Those who had a past history of breast cancer were excluded. The medical records were audited to determine how information was recorded in the initial visit, to identify which questions were asked, which physical signs were elicited. To study the pattern of documentation, we collected the details of all recorded data points. Also the graphical presentations for the physical signs were collected for analysis.

During the data collection, some themes emerged and they were categorized into following subsets of data points: reasons for visit (Table 2), risk factors and medical history, family history of breast diseases and other diseases, current history of breast disease and physical examination, diagnostic procedures, invasive and noninvasive interventions, final diagnosis, treatment, and the plan for follow-up. One hundred and eighteen (118) data points were recognized and the total numbers of entries for each of the 118 data points were recorded (Table

3). For each criterion, a rating of "Yes" or "No" was assigned. A "Yes" was given if the surgeon recorded the data point, whether or not details were provided. The quantity of all data points, if they were recorded in the charts, was entered into the database. Only data points explicitly noted in the surgeons' charts were entered into the database and we did not look into the other parts of the medical chart or external sources to complete the database. Non-recorded data points in the surgeons' notes were assigned as "missing" data (entered as "No"). For example if a surgeon did not record the age of menarche, we considered this as missing data for the chart and assigned "No" for this data point. Records in physical examination were categorized into two groups: visual description and palpation. *Visual description* included appearance of breast (its size, shape, etc), skin (scar, dimpling), retraction and nipple discharge. *Palpation* included normal breast tissue, irregularity of breast tissue, glandular texture, degree of density, nodularity, tenderness, retraction, lumpiness, and cystic lesions. The term "description" in our database represents any kind of graphical or textual description that was not mentioned with other descriptors. The data was entered into an Excel 2002 database and stored separately from chart number identifiers.

In this report, we did not analyze all 118 data points. Case-based data points such as past medical history, diagnostic procedure (ultrasound and mammogram, fine needle aspiration, core biopsy, etc) and treatment (lumpectomy, radiotherapy, chemotherapy or tamoxifen) and follow-up are specific for each patient and therefore, there was widely different documentation for different patients. For example, core biopsy, segmental mastectomy or post operative therapy are not indicated in benign breast diseases and not all malignant cases go through all above procedures and treatments. If a patient had a history of myocardial infraction, she could have a related data point in her chart. Hence, we only studied and discussed the data points which could be asked of any breast patient and were comparable across the patients (breast cancer risk factors such as age of menarche, family history of breast cancer, etc). Therefore, only 43 data

points are presented in this report (reproductive history, breast cancer risk factors, family history, past medical history and physical examination) (Table 4). Ethics approval for chart review was acquired from the Director of Professional Services (DPS) (Appendix A).

Questionnaire survey

In the second phase, in order to assess surgeons' perception of what is important in managing breast patients, a five point Likert scale questionnaire was developed. In the questionnaire, surgeons were asked about their usual practice of diagnosing and treating breast diseases and what issues they routinely address during a patient's initial encounter. They were asked to answer the questions in the following rank: always, very often, sometimes, rarely, and never. Then, each rank was standardized by giving a numerical value from 4 to zero respectively and the total numerical value was calculated from all the responses. In addition, surgeons were encouraged to list questions or concerns regarding documentation that might affect their practices.

The questions were designed with data points collected in the first phase. In this questionnaire some recorded data points (46) from the first phase were grouped into the following subsets: breast cancer risk factors, past medical history, breast cancer family history, current history, and physical examination. It included the most frequently recorded data points as well as some questions which had very low rate of documentation such as use of drugs and alcohol.

A surgeon in the breast cancer field and an epidemiologist verified the questionnaire for content validity and commented on any ambiguous, negative or leading statements. The questionnaire was revised according to their feedback and to ensure that the questions were not confusing and could be readily understood. In the cover letter (Appendix B), we explained the purpose of the questionnaire (Appendix C). Respecting that surgeons' time is limited, the

questionnaire consisted of a single page with minimal questions formatted in a clear and precise manner. It could be completed within approximately 10 minutes.

The linear relationship between what they recorded in their chart and the questionnaire survey was measured. From 46 data points addressed in the questionnaire, correlations for three data points i.e. age at which breast cancer diagnosed and death due to breast cancer in family history and history of chemoprevention were not sought. If the patient did not have a family history of breast cancer and had never been prescribed tamoxifen, then the documentation of these data points would not be necessary. Therefore, correlation for 43 data points was done.

Statistical analysis

Descriptive statistics were used. The frequency of recorded data points for each surgeon and entire group was determined and the rate of documentation for each data point was explored. The variation among surgeons' documentation for each data point was described and expressed as the mean ± the standard deviation. The commonality for data points in the clinic was sought and each surgeon's pattern of documentation was compared to the clinic's average.

All analyses and statistical tests were done using Statistical Package for Social Sciences SPSS 10.0 (SPSSPC+, Chicago, IL, USA) software. General descriptive statistics, chi-square and Spearman's rank correlation (rs) analysis were utilized with $P<0.05$ as the level of significance.

The mean and standard deviation of surgeons' responses to the questionnaire for each data point were calculated. To measure the linear relationship between the

results of the first phase of study (what they record in their chart) and the questionnaire survey (what they think is important), we used Spearman's rank correlation test (to correlate continuous variables [percentage of documentation] to ordinal variables [Likert scale]).

5. Results

112 patients' charts of 7 surgeons in the breast clinic were reviewed. Of those, 56 contained a diagnosis of cancer and the rest were benign breast disease patients. Age ranged from 23 to 91 years (mean 54.3±14.5). 36 (32%) patients were pre-menopausal and 76(68%) were post-menopausal.

The clinic's average rate of documentation (mean and standard deviation) for some data points is shown in the Table 4. It depicts that the overall rate of documentation is low with wide standard deviation for most data points. Based on the rate of documentation, we categorized the data points in 5 subgroups including 75-100%, 50-75%, 25-50%, 10-25%, and less than 10% (Table 5).

Documentation of risk factors was significantly varied among surgeons. Apart from family history, which had the highest rate of documentation in the charts (87.5±13.98%), other risk factors had low rates i.e. age of menopause (34.82±16.08%), history of breast feeding (38.39±30.92%), and age at first live birth (27.68±34.01%). Risk factors used in the Gail model were recorded approximately in one third of medical records or less i.e. age at menarche (30.4±33.9%), age at first live birth (27.7±34%) and previous breast biopsy (11.6±19.9%). History of reproduction like gravida, parity and aborta had higher rates of documentation (63.4±35.8%, 61.6±31.34% and 37.5±38.86%, respectively) in comparison to other breast cancer risk factors such as age of menarche (30.4± 33.93%) and age at first live birth (27.7±34.01%).Another group of data points, which had significantly high rates of documentation, were physical examinations such as axillary (71.4±23.4%), cervical and supraclavicular lymph nodes (60.7±34.6%) and description of mass (70.2±11%). The data points which had the lowest rate of documentation were related to general health conditions such as hypertension, diabetes (both 1.79±4.72%) and cholesterol (0.89±2.36%). Metastasis associated signs and

symptoms were also recorded at very low rates; cough and bone pain (we combined these two variables) (10.71±15.19%) and weight loss (0.89±2.36%). Also, history of breast pain and breast tenderness was recorded (20.65±24.35%) and (3.57±4.92%), respectively.

Further analysis showed that the rate of medical documentation of very few data points for older patients was significantly different from the rate for younger patients (Table 6).

Variation among surgeons' documentation

There was substantial variation among what surgeons recorded in their charts. More details are shown in Table 4. One of the main reasons for this substantial variation is that some surgeons had considerably low rates of documentation in comparison to the clinic average.

Surgeons' opinion about what are considered important variables in managing breast patients

In the questionnaire (Table 7, Figure 1), surgeons reported that they asked *very often/ always* the majority of data points [29 of 46(63%] in the questionnaire. Most breast cancer risk factors and physical examination elements were rated *very often/always*. Risk factors such as "age at first live birth" and "age of menarche" were not ranked as high as other data points like the "history of hysterectomy" or "oophorectomy"(*sometimes/very often* vs. *very often/always*). With regard to general medical conditions like "diabetes" and "hypertension", they stated that they would address them more than *sometimes* (2.17). For "drug allergy" and "metastasis related signs" (i.e. cough, bone pain and weight loss), these rates were almost *sometimes* (1.83) and *rarely/sometimes* (1.29), respectively. In contrast to low rate of documentation for breast tenderness and pain (10.71 and 20 %), they asserted that they address these data points almost *always* (both 3.86).

One issue worth noting is that for some data points there was no or very low difference among their perception (such as "age of patient", "family history", "history of previous breast cancer", some elements in physical examination i.e. "lymph nodes" and "hormone replacement therapy [HRT]"). However, there was considerable variation in their perception about some other data points such as "age of menopause" , "history of breast-feeding", "age at first live birth" and " age of menarche", "diabetes and hypertension" and "drug allergy" (Table 7). In the latter group, the lower the score given to the data points in terms of their" importance", the higher the variation among surgeons' perceptions existed. Variables that can be used in diagnostic approach and patients' management had higher scores including the established risk factors and elements of physical examinations and hormonal issues (such as "exogenous estrogen" [HRT, OCP], "oophorectomy" and" previous mammogram). "Age of patient", "family history of breast cancer" and "lymph nodes" were the only three data points that all surgeons stated that they *always* address. "History of endometrial cancer" and metastasis related signs such as "cough and bone pain" and "weight loss" had the least amount of importance in their view.

Correlation between "what they record in their medical charts" and "what they said is important in managing breast patients"

There were weak correlations between "what they record" and "what they think is important". For one surgeon there was no correlation ($r=0.16$; p value=0.16). For two surgeons, these correlations were more than 0.5 ($r=0.51$, $r=0.61$; p value<0.01) and for the remaining surgeons, it was less than 0.5 ($r<0.5$; P value <0.01) (Figures 2-8).

6. Discussion

This study was carried out to determine the current pattern of documentation and assess the needs of prospective electronic system users. This study had four major results: 1) low rate of documentation, 2) dramatic variation among surgeons' documentation, 3) variation in surgeons' perception of what is important, and 4) weak correlation between what surgeons recorded (charts) and what they said is important (questionnaire).

It seems that some data points have significant value for surgeons in terms of diagnosis, management and decision-making. For example, data points such as axillary, cervical and supraclavicular lymph nodes and description of mass are recorded more frequently ((71.4±23.4%), (60.7±34.6%) and (70.2±11%), respectively. In contrast, and in spite of the importance of some data points (i.e. those related to breast cancer risk factors such as age at menarche, age at first live birth and previous breast biopsy), these risk factors are not recorded as often as positive physical signs. This may indicate that surgeons' cannot use these variables in their daily practice.

"Current age" is valuable predictor for patient management and follow-up as a well-established risk factor for breast cancer.[43] By comparing two groups of patients according to their age, women younger and older than 50 years (Table 6), except for a minority of data points (i.e. gravida, history of breast feeding and age of menopause), there was no significant difference in the rate of documentation between these two groups. This may indicate that surgeons' documentation is not influenced by established risk factors like age; it seems that they may have the same pattern of documentation for all patients regardless of their individualistic characteristics and risk factors.

There was weak correlation between what surgeons recorded (documentation) and what they said (opinion) with regard to important data points. This weak correlation may stem from several reasons.

As they stated in the questionnaire, they may believe that there are invaluable data points for diagnosis and follow-up (such as breast cancer risk factors). They may address many of them, but they do not record them because of issues like time limits and work overload or it may indicate that surgeons responded to the questionnaire by what they were taught in the past but do not consider them as valuable data to be employed in their actual practice. Based on epidemiologic studies, some data points, such as breast cancer risk factors used in the Gail model are important. But if they routinely do not use this model to calculate the relative risk of breast cancer, they will not be able to objectively use the recorded data points. In either situation, they ask few questions and record even less. For example, in the questionnaire they responded, with wide variation, that they asked "age at first live birth" and "age of menarche *sometimes/ very often* (3.34 and 3.29, respectively). In their medical charts, they record them in less than one third of visits, (27.68±34.01%) and (30.36±33.93%), respectively.

Another reason for the discrepancy can be personal habit. Variables like "gravida" and "parity" were recorded more frequently in comparison to" age of menarche"; yet according to the Gail model, they cannot be specifically used for breast cancer risk assessment. It may also be that "gravida", "parity" and "aborta" (GPA) are three questions that are routinely asked of every female patient to assess their reproductive history. Also, recording variables such as history of hypertension or diabetes, which do not have any diagnostic role in breast care can also be attributed to personal habit. For some data points such as breast pain and tenderness, there is no established evidence showing their predictive value, yet surgeons stated that they almost *always* address, both (3.86), but interestingly they rarely record them, (3.57±4.92%) and (20.65±24.35%), respectively.

What should be documented in the medical record?

In medical documentation, doctors record some specific data points and not others. What determines their questions? Are there any data points that should be definitely be asked (i.e. "important")? Is every data point important and influences the physician's practice?

One assumption could be that by giving a complete picture of the situation to the practitioners, they would be able to use all information for decision-making. In epidemiological studies, the more information we have, the better understanding of the behavior of the disease is expected. From clinical perspective, however, only essential and discriminative data points for diagnosis and decision-making are considered relevant rather than nonselective information, which cannot be used in the point-of-care. In other words, clinicians can make a decision, if "significant" data points are provided and giving additional nonspecific information might not influence their decision.

In breast care, variables could be categorized into three groups: 1- discriminative data points, 2- complementary data points and 3- nonspecific data points.

Discriminative data points

For decision-making, diagnosis and follow-up of breast patients, the fundamental criteria that should be met for data collection rests in their discriminative values. In other words, asking any question or performing any physical examination should lead toward discrimination between cancerous and non-cancerous cases (i.e. variables such as description of mass, the status of lymph nodes, etc). Logically, if some data points are very important and have discriminative values in diagnosis, management and decision-making for breast disorders, they should be asked and recorded in all patients' encounters.

Complementary data points

Some other data points are not essential for immediate diagnosis. Breast cancer risk factors are in this group, and they could be used to calculate patients' relative risk of breast cancer. These data points could be used to determine which patients are high risk patients and might impact their surveillance and follow-up schedule. Even though they are not crucial for diagnosis, their application can improve quality of care. If, for whatever reason, surgeons cannot objectively use them in their daily practice (for example using the Gail model to calculate a numerical value of relative risk), there would be no benefit recording them and it is highly unlikely that practitioners would document them in their medical charts.

Nonspecific data points

Knowledge about lipid profile or blood sugar of a patient are not useful in diagnosis of breast cancer and should not be expected to be asked and documented in patient's chart. They would, however, be expected to be recorded and documented if they are needed for preoperative assessment.

In the study of documentation, clinical expertise should not be overlooked. This expertise can be reflected in the documentation as well. Therefore, the pattern of documentation should be sought in the way they think, practice and make decisions. Personal expertise and heuristics are important sources of knowledge in practice. Reliance on professional intuition is a necessity and can play a major role. Heuristics provide personal criteria for making clinical decisions.[44] In the practice of medicine neither evidence from randomized controlled trials nor observational methods can dictate action in particular circumstances which guidelines do not match the needs of patients (grey zone). Clinical reasoning,

with its reliance on experience and extrapolation, must be applied to traverse the grey zones of practice.[45]

Experts use a quite different pattern of reasoning from that used by novices or intermediates and organize their knowledge differently.[46] They have more advanced decision strategies in comparison to novices. They tend to focus on developing a more refined situational analysis of the decision problem. [47] Three important aspects are (a) experts have a greater ability to organize information into semantically meaningful, interrelated chunks, (b) they do not process irrelevant information and, (c) in routine situations, they tend to use highly specific knowledge-based problem solving strategies.[48,49] By experience, practitioners become able to recognize patient problems immediately, because they have developed "memory chunks" [50] for clusters of findings that are repeatedly encountered. This complex knowledge structure enables experts to take shortcuts, and hence more efficiently use the time and memory capacity available for case solving.[51]

Expert clinicians might have the same behavior in documentation and do not record the whole process of their diagnostic approach and only document those few data points that they think are essential. Indeed, if a surgeon detects a suspicious mass in his physical examination, regardless of how much the patient is at the risk of breast cancer (positive or negative risk factors), it is expected that he proceeds to perform a diagnostic approach (ultrasound, biopsy,etc) and does not ask or record any other questions with respect to patient's characteristics and risk factors.

Having said that, because of their expertise, they do not elicit and record all information, it does not mean that we should assume the more expert physicians become, the lower documentation they have. The patient's history is needed for record-keeping purposes both for professional and legal necessities. They should record some data points showing their diagnostic approach, diagnosis, management and follow-up. Indeed, overemphasis on the personal knowledge of physicians and its role in clinical practice, its reliability and efficacy, have been

the target of criticism. In general, humans tend to have much greater confidence in their knowledge base than is warranted.[52] In medical practice, there is a habit of thinking that all current practice is accepted as well-founded and correct.[44] Even though, physicians' preference and clinical expertise are crucial issues, we should always search for specific rationales in practices in order to distinguish between those that are based on scientific evidence and those that are not.

EHR can help the health system to standardize clinical expertise. By means of EHR, the health system can identify the assumptions, rationale, and evidence upon which our current practices are based. The heuristics that hold up—by being confirmed by the results of future studies—should be retained and reinforced. Those that do not, should be discarded. It should be judged on the basis of historical experience (how well the heuristics have predicted the outcome of clinical trials), statistical principles (small samples do not accurately represent general populations), comparisons of underpinning theories with real data and how consistently a particular heuristic is used.[44]

To design an EHR, we should find those discriminative data points (showing the process of care - partly from literature and partly from individual practice) and include other elementary components which are not used for diagnosis but are essential in ideal documentation (administrative, communicative and legal). Indeed, clinical intelligence should be kept in the practice and should not be lost in an inflexible and imposed system. With respect to physicians' clinical autonomy, intelligence, intuition and experience in clinical decision-making, EHR should be designed in such a way as to accommodate each individual based on common practice and their preference to facilitate and encourage the participation of physicians in the process of care.

Approaches to designing an EHR

If the objective is to design an effective electronic record, the inclusion of both extensive and nonselective variables, which makes the EHR unnecessarily complicated and busy, should be balanced with making the EHR as a user friendly tool which basically accommodates essential variables and takes into account physicians' preferences. If the documentation is facilitated by the use of time-saving electronic toolsets, it is expected to ease the process of documentation and liberate the physicians' time by having to spend less time on clerical duties to complete the patient's chart and give them more time to gather truly important data points (e.g. breast cancer risk factors) not usually collected. Three major sources of knowledge required to ensure a successful design are: medical literature and evidence-based knowledge; current pattern of documentation and experts' opinion and preferences. These are additional considerations to ensure toolset acceptance and wide-spread use.

One design could be based on comprehensive (executive) approach which relies on medical literature and evidence-based medical information. It will include all available variables derived from literature and necessitate the practitioners to enter most, if not all, data points. Even though this approach can potentially provide an extensive database with epidemiologic applications, it is unlikely to be accepted nor widely used by physicians. Indeed, this approach ignores the physicians' autonomy and individual expertise. It only overloads their clerical tasks and does not benefit them in their daily practice. Finally, it has been shown that this approach fails from the very beginning.

If one of the goals of the design is to improve medical documentation, the current trend of low documentation should not be ignored. Without resolving the real causes and obstacles, physicians will not likely welcome any imposed new standards of practice. Indeed, ignoring the value of physicians' intuition and

experience and imposing a predefined system upon physicians, will almost guarantee failure in that they do not have any incentive to use this system, even worse, they may perceive it as a threat to their professional autonomy which will ultimately diminish their participation, delivering the final blow to the application. Several issues are required to be considered; (1) they should believe the documentation of a "data point" is necessary and adds value; (2) data entry and data retrieval should not take more time than traditional paper medical record and (3) they should be able to see the benefits of data gathering. If they do not think it is needed or if documentation takes up a considerable amount of their time or they cannot use it in their practice, the reasonable expectation is that they will not record them. To receive their active and autonomous participation, EHR should be able to show the benefit of each data point and rewards them for their participation.

For successful implementation, personal knowledge and expertise (their pattern of documentation and preference) which physicians have obtained through years of studies and experience should also be taken into consideration and, therefore, EHR should be designed in such a way to look like what they normally do. Meanwhile, EHR should help them to discard any scientifically baseless and wrong practice. For example, the perception of the importance of variables such as history of breast pain or tenderness (as they stated in the questionnaire) has not been shown to have any value to discriminate malignant from benign cases. Also, there is no evidence showing that reproductive history such as gravida, parity and aborta are more important than other breast cancer risk factors such as age of menarche or breast feeding (clearly indicated in their charts and expressed in the questionnaire). One surgeon records the variables like hypertension or diabetes more frequently; these variables are related to the general health condition and are not used in the breast care.

Solution

As medical knowledge originates from a variety of sources, the best strategy to design an effective electronic record is to explore and take into consideration all available sources. The value of rigorous statistical-based medical knowledge should be balanced against surgeons' individual pattern of documentation and their perception regarding essential data points. The EHR can build a bridge between the relatively rigorous objectives of statistical-based knowledge and personal preference and expertise. This may imply that physicians need a system to actively involve them and encourage them to practice according to the available evidence.

We can use our data to design a primary EHR in such a way as to use the same data points currently recorded by each individual surgeon i.e. creating the electronic version of their individual charts. The designed electronic chart will look like what they do, at present, with a few data points added. It will foster a feeling of "ownership" and they will use it more comfortably. The medium will have two layers of data points; "exposed" and "hidden". The exposed layer is designed based on each individual surgeon's current documentation as well as high frequently recorded data points in the clinic (Table 4, 5). These data points are breast cancer risk factors including family history, reproductive and past medical history and physical examination. These data points will be available to all surgeons. EHR can also include each surgeon's personal preference. If a surgeon records variables such as breast pain and tenderness or hypertension or diabetes, he will be able to introduce these data points into his patients' charts. The underlying or hidden layer is available upon request and offers a broader range of data points. The selection of these additional data points should be based on evidence available in the medical literature. Some surgeons, who record very few data points, can either choose to continue their current low rate of documentation or to use these supplementary data points by selecting the

hidden layer in their charts. To encourage surgeons to use additional data points, they must be assured that these data points have added value (e.g., providing breast cancer risk assessment, evidence-based follow-up schedule). Breast cancer risk assessment (by Gail model) is an easily applicable example of this proposal. By collecting data points used in the Gail model, surgeons will be offered a numerical estimation of breast cancer risk to determine the preventive strategy and patients' follow-up. This strategy will persuade them to use more data points and "adopt" and apply more evidence-based medicine in their practice.

Therefore, by accommodating the physicians' preference, they are encouraged to actively participate in the process of care. A reciprocal relationship is encouraged, where evidence-based knowledge is provided which not only assists them to update their medical knowledge and to fill in the gaps, but it also gives them a chance to abandon wrong behaviors and improve their medical practice including documentation. For example, as generalized breast pain and tenderness are not useful data points in breast care, this system may assist surgeons to spend their time gathering more useful data points. The interactive process fostered by EHR can modify their clinical behaviors and shrink the wide variation between their opinion and their practice. In this medium, evidence-based information and the findings of relevant studies are provided and physicians are able to use their professional expertise toward interpreting these aggregated studies.
By combining their professional skills with evidence-based medicine, physicians will retain their pivotal role over clinical decision-making and not perceive it as a threat to their autonomy. In other words, doctors' expertise and individual preference will be set as a common ground to standardize the practice.
In addition, as all details of medical practice are reflected in EHR, the health system can constantly examine and monitor or, better still, self-monitor physicians' clinical practice, documentation and decision-making which in turn will help the system to explore the possible reasons for variations.

An electronic system can also give physicians accurate and timely feedback making them more aware of their practice. By continuous feedback on clinical behaviors, it helps them to make better decisions and practice. For example, they will be made aware of areas for improvement. One reason for weak correlation between "what they do" and "what they think is important" can be their unawareness of their deficient documentation. For one surgeon, there was "no" correlation in this regard and it is reasonably possible to assume that the results of this study, as feedback, are invaluable and may result in an immediate modification in the pattern of documentation.

Strengths and Limitations

One strength of this study is that we collected all available data points in surgeons' medical charts. This strategy could decrease the chance of bias in data collection. We reviewed the surgeons' personal notes (charts) that are not accessible in the hospital medical records. Both cancer and non-cancer patients were equally included in the study to cover all possible variability. Indeed, this study was done in a highly specialized breast center where each surgeon sees the same population of patients and all surgeons use the same facilities which, in turn, minimize the role of external factors in variability.
This study was carried out based on the assumption that higher quality of documentation will result in higher quality of care. However, there is no data suggesting what an optimal and appropriate level of documentation entails. Moreover, there is no data in literature that accurately determines the value of each variable in breast care. Nevertheless, the correlation between each individual's documentation and their perception of is important can be studied regardless of the level of documentation.

One limitation of this study occurs because of the structural nature of medical chart review. The paper-based medical record is not the most optimal alternative

but rather, it is the only available tool. We should be aware of the structural weaknesses of the paper medical record and should not set a high expectation for obtaining a reliable and an all-encompassing picture of current practice by auditing the medical record.

Another limitation is that the results of this study cannot be used to explain the reasons for this variability for one surgeon, patient to patient, among surgeons or any other cause-effect conclusion. As the outcome of their practice was beyond the scope of this study, any conclusion with regard to better documentation cannot be drawn. Also, we had limited knowledge about other factors that could cause variability in surgeons' documentation. We did not explore other variables such as surgeons' workload, their personal characteristics (age, gender, etc.) and other factors related to the patients characteristics such as contextual variables on geographical areas and reasons for visit which can potentially cause variation in the rate of documentation. However, as all participating surgeons had medical training in North America, mostly at McGill, and see the same population of patients and utilize the same facilities, we would expect that these similarities narrow the variability down to personal preferences.

As the actual values of data points were not sought and the validity of data points was not checked with external sources, the positive or negative value in this context does not necessarily mean that corresponding data existed or not. For example, for some patients, the gravida was not recorded even though the patient had children. "Age at first live birth" or "history of breast-feeding" are only appropriate for patients who have children; a question about history of hysterectomy and oophorectomy might not be appropriate for young fertile patients. Clearly, some data points are more appropriate for particular patients. For example, age of a relative with breast cancer is suitable for patients with positive family history of breast cancer or last menstrual period and regularity of menses should be asked in pre-menopausal women. For this reason, what is presented is the unadjusted frequency of data points recorded by surgeons. The

drawbacks of this limitation are that the rate of some data points might be overrated or underestimated.

Since this study was based on the interpretation of records written in the surgeon's own hand, another issue could be that their penmanship was not legible and/or partially or fully misinterpreted by the investigator.

7. Conclusion

This study was carried out to determine the rate of documentation, surgeons' general consensus on data points and commonality in their documentation and correlation between what surgeons think is "important" and their performance in daily practice. There was a constantly low rate of documentation, and substantial variation in the rate of items recorded by surgeons. In the questionnaire, they stated that they would address many data points in each patient's encounter which was not consistent with what they recorded in the patients' charts i.e. indicated by weak correlation between the two. Indeed, there was even a wide variation in their opinion on some data points.

8. Summary

This study was carried out in the Cedars Breast Clinic between year 2002 and 2003. The purpose of this study was to determine the current pattern of documentation and assess the needs of prospective electronic system users. There was a constantly low rate of documentation, and substantial variation in recorded items among surgeons. Their perception with regard to the important data points in breast care management was varied and there was weak correlation between what they recorded (charts) and what they said was important (questionnaire). The following explanation is offered for consideration.

For the low rate of documentation, it is possible that physicians address many questions, perform several physical examinations, but not record them. It could be because of factors such as workload and time constraints. The wide variation in the documentation of surgeons may be because of their personal preferences and habits. This was reflected in variation in their opinion with respect to some data points.

The fact that they recorded some variables not others implies, for some reasons, they consider some variables more important. For example, "family history of breast cancer" constantly had the highest rate of documentation. Also other variables such as physical examinations i.e. "description of mass" and "lymph nodes" were more frequently recorded by surgeons. This implies that these data points may determine the management and aid them in their decision-making.

Their perception, as reflected in the questionnaire seems to demonstrate what they believe, based on their cumulative medical knowledge and experience, is essential in breast care management. They stated that "age", "family history of breast cancer" and "lymph nodes" are the three variables that they always address in their patient's encounter. Interestingly, in the questionnaire, they

asked *very often* to *always* in majority of data points (29 of 46 or 63%). This claim was not compatible with their actual documentation. This weak correlation may be explained as follows. It is possible that they cannot objectively relate their subjective theoretical knowledge (i.e. established breast cancer risk factors) to an individual case. It is reasonable to assume that if they cannot objectively use this knowledge in their decision-making, that they do not spend time to ask those certain questions. In contrast, as they can use some information such as the description of mass and axillary and cervical lymph nodes in patient care, they recorded them more often than other variables. There were some data points such as breast pain and tenderness that were frequently asked without any objective usage. It seems that some traditions in the medical community dictate asking these factors, even though they have not been rigorously scrutinized.

This study indicates that current medical documentation does not accurately represent what clinicians think is important. The results of this study will be used to design an Electronic Health Record (EHR) which can be done by combining the current individual documentation preference and additional data points from evidence-based knowledge and surgeons' general consensus. This self-evolving adaptive system should give rise to higher quality of care in future.

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Table 1-The Functions of Medical Record

Primary functions Supporting direct patient care • Aide mémoire • Support clinical decision-making • Communication
Secondary functions Medico-legal record Source of information for: • Clinical audit and research • Resource allocation • Epidemiology • Service planning

Table 2- Reasons for visit Recorded by 7 Surgeons in 112 Medical Charts in the Cedars Breast Clinic 2002-2003

Reasons for visit	No of patients
Breast lump	31
Breast pain	9
Breast lump and abnormal mammogram	1
Breast lump and pain	4
Breast lump and referred by physician	4
Breast lump and nipple discharge	1
Swelling and redness of breast	1
Nipple discharge	3
Referred by physician	7
Abnormal mammogram	30
Abnormal ultrasound	1
Routine clinical examination	4
Swelling, redness of breast and abnormal mammogram	1
Pain, swelling and redness of breast	1
Swelling and nipple discharge	1
Nipple discharge and abnormal mammogram	1
Not recorded	12

Table 3- Data Points Recorded by 7 Surgeons in 112 Medical Charts in the Cedars Breast Clinic 2002- 2003

Data points
Reasons for visit
Breast lump
Breast pain
Breast lump and abnormal mammogram
Breast lump and pain
Breast lump and referred by physician
Breast lump and nipple discharge
Swelling and redness of breast
Nipple discharge
Referred by physician
Abnormal mammogram
Abnormal ultrasound
Routine clinical examination
Swelling, redness of breast and abnormal mammogram
Pain, swelling and redness of breast
Swelling and nipple discharge
Nipple discharge and abnormal mammogram
Not recorded
Characteristics, risk factors and past history
Current age
Age menopause
Gravida
Parity
Aborta
Age of menarche
Age at first live birth
History of breast-feeding
Total abdominal hysterectomy (TAH)
Oophorectomy
Family history of breast cancer
Age of relative with breast cancer
Family history of ovarian cancer
Age of relative with ovarian cancer
Endometrial cancer
Family history of other cancers
History of Breast self-examination
Last menstrual period (LMP)
Regularity of period
HRT- OCP
Chemoprevention
Type of Chemoprevention

Table 3- Data Points Recorded by 7 Surgeons in 112 Medical Charts in the Cedars Breast Clinic 2002- 2003 (continued)

History of Chemo &Radiotherapy
Medications
Drug allergy
Hypertension (HTN)
Diabetes mellitus (DM)
Cholesterol
Past medical history
History of present illness
Mammogram
Abnormal Mammogram
Benign mammogram
Mammogram /soft tissue lesion
Mammogram / Microcalcification
Mammogram / suspicious
BI-RADS[1]
Abnormal Ultrasound
Cyst
Breast lump
Breast tenderness
Nipple discharge History
Redness
Cough/bone pain
History of breast cancer
Fine needle aspiration (FNA)/ Cytology
Biopsy
Reduction mammoplasty
Segmental Mastectomy
Axillary lymph node dissection (ALND)
Total mastectomy
Major operation in other parts of body
Breast surgery other than cancer
Weight loss
Fatigue
Physical examination
Appearance of breast
Skin
Description of breast
Normal breast tissue
Irregularity breast tissue
Glandular texture
Density

[1] Breast Imaging Reporting and Data System

Table 3- Data Points Recorded by 7 Surgeons in 112 Medical Charts in the Cedars Breast Clinic 2002- 2003 (continued)

Nodular
Tenderness
Retraction
Cyst
Lumpiness
Mass
Description of mass
Round/ Smooth Mass
Axillary Lymph nodes
Cervical or Supraclavicular nodes
Nipple discharge
Diagnostic interventions (invasive and non-invasive)
Mammogram
Mammogram/Normal
Mammogram/Benign
Mammogram/soft tissue lesion
Mammogram / Microcalcification
Mammogram/ suspicious
BI-RADS
Ultrasound
Chest X ray
Ductogram
Cytology of discharge
Bone scan
Drainage
Fine needle aspiration (FNA)/ Cytology
Core Biopsy
Ultrasound guided needle localization+ axillary lymph node dissection
Incisional Biopsy
Excisional biopsy
Mastectomy or Segmental mastectomy
Axillary lymph node dissection
Sentinel node biopsy(SNB)
Management and treatment
Monthly self-examination
Mammogram
Ultrasound
Bone scan
Return Visit (months)
Follow-up with physician
Neoadjuvant-chemotherapy
Radio/Chemotherapy
Tamoxifen

Table 4 - Frequency of Data Points (Clinic Average, SD) Recorded by 7 Surgeons in 112 Medical Charts in the Cedars Breast Clinic 2002-2003[2,3]

Data point	Mean(%)	SD(%)	P value
Reproductive history			
Gravida	63.39	35.8	0.00
Parity	61.61	31.34	0.00
Aborta	37.5	38.86	0.00
Breast cancer risk factors			
Age of menopause	34.82	16.08	0.09
Age of menarche	30.36	33.93	0.00
Age at first live birth	27.68	34.01	0.00
Breast feeding	38.39	30.92	0.00
Family history			
Family history of breast cancer	87.5	13.98	0.01
Age of relative with breast cancer	11.79	6.9	0.00
Family history of ovarian cancer	26.79	28.35	0.22
Family history of other cancers	3.57	3.34	0.80
Past medical history			
Hysterectomy	17.86	18.55	0.00
Oophorectomy	13.39	12.2	0.55
Endometrial cancer	1.79	3.05	0.53
Breast self-examination (BSE)	8.93	18.7	0.00
Last menstrual period (LMP)	20.54	15.19	0.04
Regularity of menses	16.96	11.81	0.15
HRT- OCP	52.68	21	0.01
Medication	25.89	35.98	0.00
Hypertension	1.79	4.72	0.06
Diabetes	1.79	4.72	0.57
Cholesterol	0.89	2.36	0.42
Past medical history	16.96	19.67	0.00
Breast tenderness	3.57	4.92	0.35
Breast pain	20.65	24.35	0.00

[2] Frequencies of documentation are not shown for each surgeon.
[3] P values show whether there is significant variation among surgeons with regard to each data point or not.

Table 4- Frequency of Data Points (Clinic Average, SD) Recorded by 7 Surgeons in 112 Medical Charts in the Cedars Breast Clinic (2002-2003) (continued)

Data point	Mean(%)	SD(%)	P value
Past medical history (continued)			
Cough and bone pain	10.71	15.19	0.00
Major operation on other part of body	9.82	9.45	0.14
Breast surgery other than cancer	11.61	19.9	0.00
Weight loss	0.89	2.36	0.42
Physical examination			
Visual description			
Appearance of the breast	29.46	26.93	0.00
Description of breast	49.11	23.23	0.00
Tenderness	7.14	5.62	0.60
Nipple discharge	6.25	7.22	0.21
Palpation			
Description of mass	70.2	11	0.00
Description of axillary lymph nodes	71.4	23.4	0.00
Cervical or supraclavicular nodes	60.7	34.6	0.00
Normal breast tissue	20.54	11.3	0.28
Irregularity breast tissue	6.25	6.25	0.38
Glandular texture	3.6	0.19	0.80
Density	0.89	2.36	0.42
Nodularity	12.5	8.84	0.33
Lumpiness	2.68	4.92	0.18
Cyst	5.36	5.62	0.43

Table 5 - Data Points Grouped According to Frequency in the Medical Charts

Data point	Frequency (%)
100-75 %	
Family history	88
75-50 %	
Axillary lymph nodes	71.4
Description of mass	70.2
Gravida	63.4
Parity	61.6
Cervical or Supraclavicular lymph nodes	60.7
HRT-OCP	52.7
50-25 %	
Description of breast	49.1
Breast feeding	38.4
Aborta	37.5
Age of menopause	34.8
Age of menarche	30.4
Appearance of the breast	29.5
Age at first live birth	27.7
Nipple discharge	27.7
Family history of ovarian cancer	26.8
Medication	25.9
25-10 %	
Breast skin	25
Breast pain	20.7
Last menstrual period (LMP)	20.5
Hysterectomy	17.9
Regularity of menses	17
Past medical history	17
Oophorectomy	13.4
Age of relative with breast cancer	11.7
Breast surgery other than cancer	11.6
Cough and bone pain	10.7
Less than 10 %	
Major operation (on other part of body)	9.8
Breast self-examination (BSE)	8.9
Tenderness	7.1
Nipple discharge	6.3
Family history of other cancers	3.6
Breast tenderness	3.6
Endometrial cancer	1.8
Hypertension	1.8
Diabetes	1.8
Cholesterol	0.9
Weight loss	0.9
Drug allergy	0

Table 6 - Comparison Between Two Groups of Patients' Charts (Younger and Older than 50)

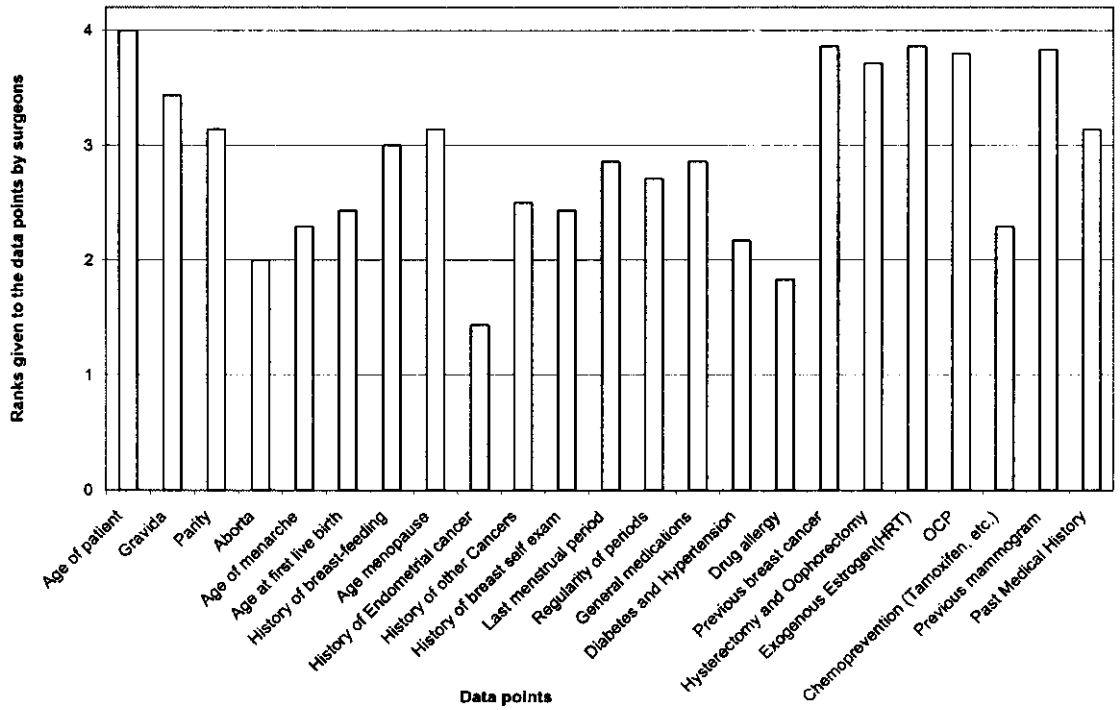
Grouped into "Data Points Recorded More Frequently in Younger than 50 Years Old"," Data Points Recorded More Frequently in Older than 50 Years Old"," Data Points with No significant Difference in their Documentation Between Two Groups"(significant P value<0.05)

Data point	% - younger than 50 years old	% - older than 50 years old	P value
Recorded more often in "younger than 50 years old"			
Nipple discharge	39	21.1	0.04
History of breast-feeding	51.2	31	0.03
Aborta	51.2	29.6	0.02
Gravida	80	53.5	0.00
History of breast lump	48.8	21.1	0.00
Last menstrual period	48.8	4.2	0.00
Regularity of periods	41.5	2.8	0.00
Recorded more often in "older than 50 years old"			
Age of menopause	9.8	53.5	0.00
No significant difference between younger and older patients' charts			
General medications	26.8	25.4	0.86
History of breast self-exam	9.8	8.5	0.82
Breast pain	22	20	0.81
Past medical history	14.6	18.3	0.62
Family history of other Cancers	4.9	2.8	0.57
Hysterectomy	14.6	19.7	0.50
Cholesterol	0	1.4	0.45
History of breast cancer	0	1.4	0.45
Oophorectomy	9.8	15.5	0.39
Redness	33.3	0	0.36
Exogenous estrogen (HRT)	46.3	56.3	0.31
History of endometrial cancer	0	2.8	0.28
Hypertension	0	2.8	0.28
Diabetes	0	2.8	0.28
Weight loss	2.4	0	0.19
Fatigue	2.4	0	0.19
Age of menarche	39	25.4	0.13
Cough and pain	4.9	14.1	0.13
Age at first live birth	36.6	22.5	0.11
History of breast tenderness	7.3	1.4	0.11
Family History of ovarian cancer	24.4	28.2	0.08
Family History of breast cancer	95.1	83.1	0.06
Parity	73.2	54.9	0.06

Table 7- Number of Surgeons' Reporting Data Point as "Important" in Managing Breast Patients as per Likert Scale Questionnaire

Data Point	Always	Very often	Sometimes	Rarely	Never
Risk Factors and past history					
Age of patient	7	0	0	0	0
Gravida	6	0	0	0	1
Parity	5	0	1	0	1
Aborta	3	0	1	0	3
Age of menarche	2	2	1	0	2
Age at first live birth	3	1	1	0	2
History of breast-feeding	4	1	1	0	1
Age of menopause	4	2	0	0	1
History of endometrial cancer	2	0	1	0	4
History of breast self-examination	2	1	3	0	1
Last menstrual period (LMP)	3	1	2	1	0
Regularity of periods	2	2	2	1	0
Medications	3	1	2	1	0
Previous breast cancer	6	1	0	0	0
Hysterectomy and Oophorectomy	5	2	0	0	0
Exogenous estrogen (HRT)	6	1	0	0	0
Chemoprevention (Tamoxifen, etc.)	3	1	0	1	2
Past medical history	3	2	2	0	0
Breast surgery	4	2	1	0	0
Family history					
Family History of breast cancer	7	0	0	0	0
Age at which breast cancer diagnosed	5	1	1	0	0
Family history-Death due to breast cancer	6	2	0	0	0
Family History of ovarian cancer	5	1	1	0	0
Current history of breast disease					
Lump	6	1	0	0	0
Tenderness	6	1	0	0	0
Pain	6	1	0	0	0
Nipple discharge	4	2	1	0	0
Cough, bone pain, weight loss,etc.	0	0	3	3	1
Physical Examination					
Nodularity	4	2	1	0	0
Lumpiness	4	2	1	0	0
Degree of tenderness	2	1	3	1	0
Description of mass	6	1	0	0	0
Lymph nodes	7	0	0	0	0
Nipple discharge	4	3	0	0	0

Figure 1 - Ranks Given to Data points by Surgeons in Likert Scale Questionnaire (Mean)



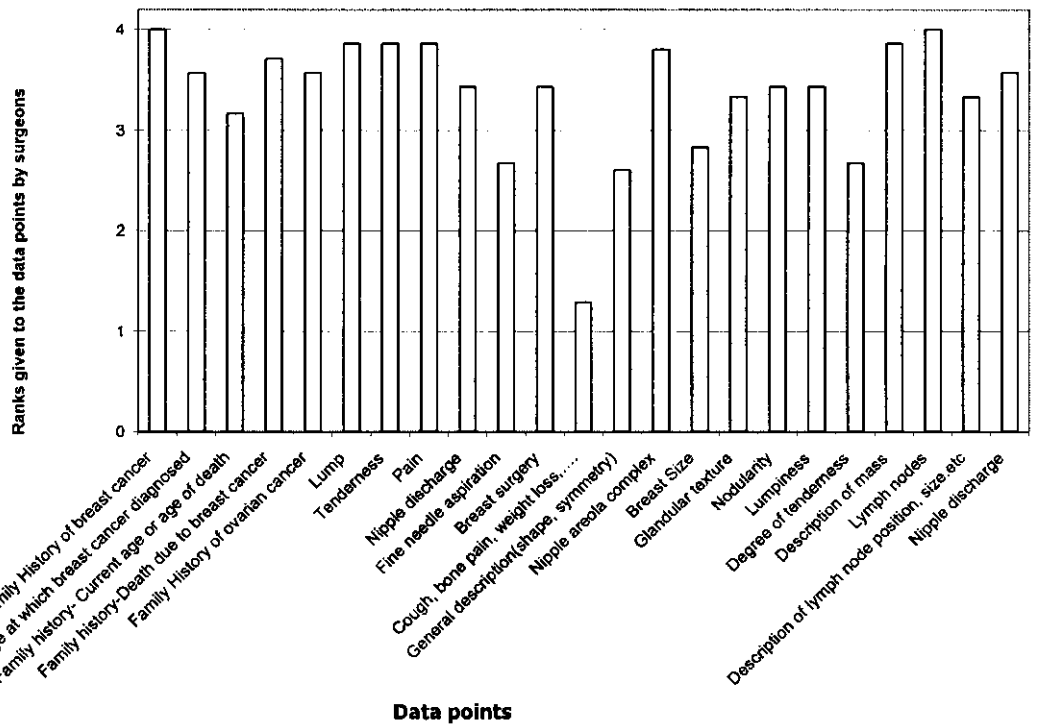


Figure 2 - Correlation between What Surgeon Records and Thinks is Important in Managing Breast Care – Surgeon 1(r=0.4, P value<0.01)

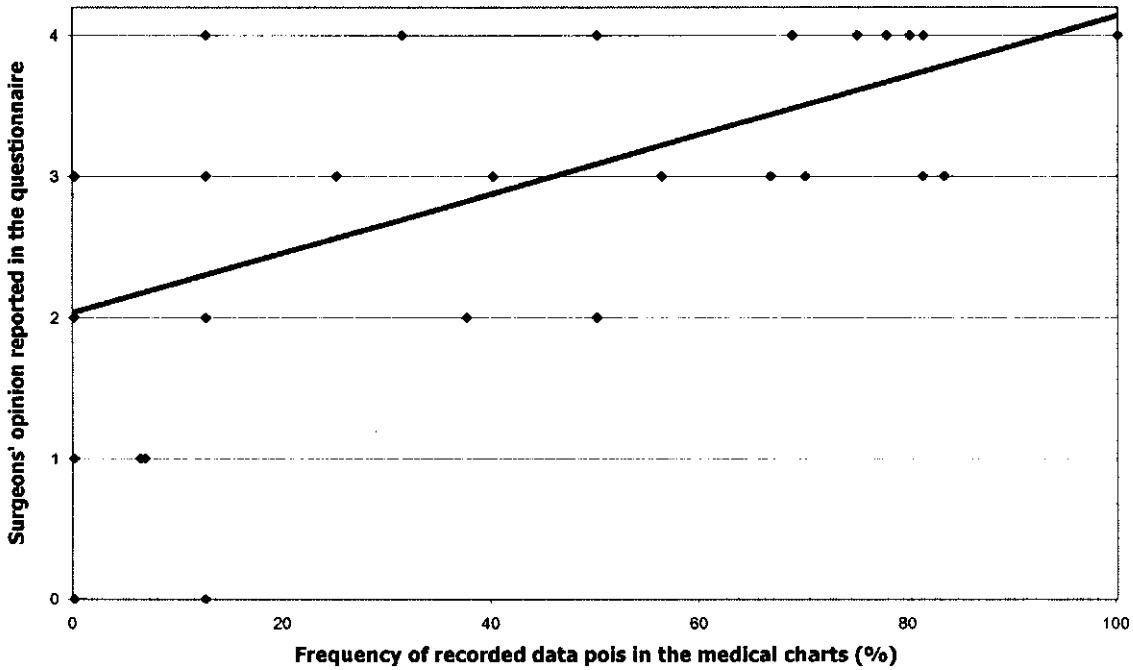


Figure 3 - Correlation between What Surgeon Records and Thinks is Important in Managing Breast Care – Surgeon 2 (r=0.16, P value=0.16)

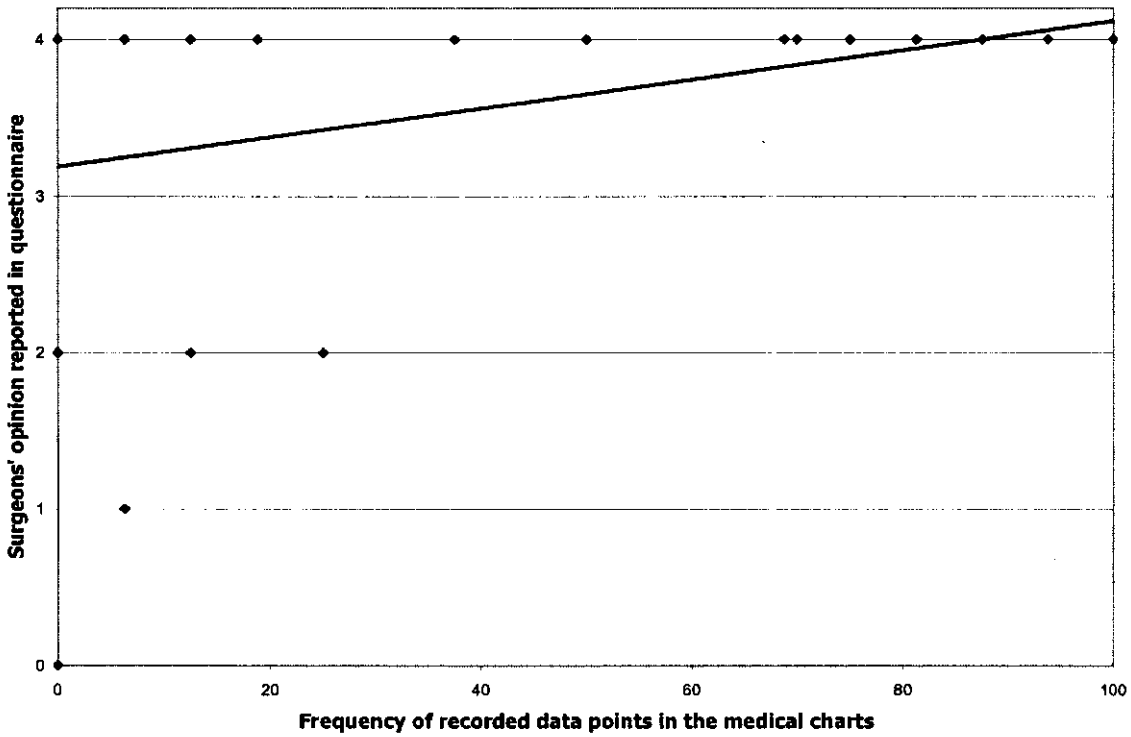


Figure 4- Correlation between What Surgeon Records and Thinks is Important in Managing Breast Care – Surgeon 3 (r=0.41, P value=<0.01)

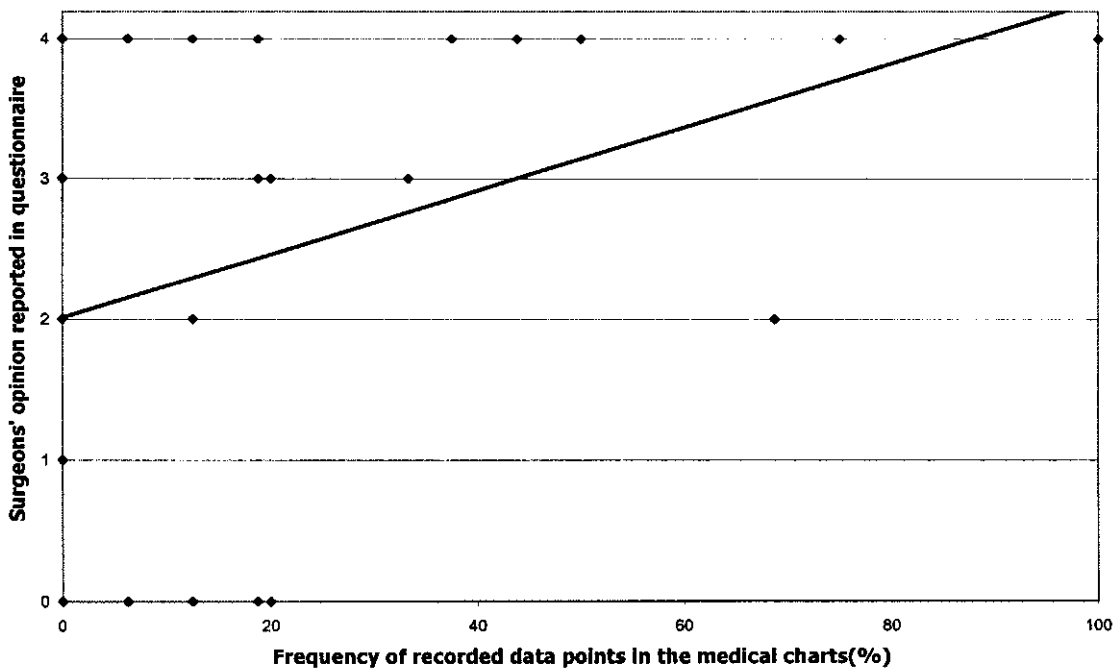


Figure 5- Correlation between What Surgeon Records and Thinks is Important in Managing Breast Care – Surgeon 4 (0.51, P value<0.01)

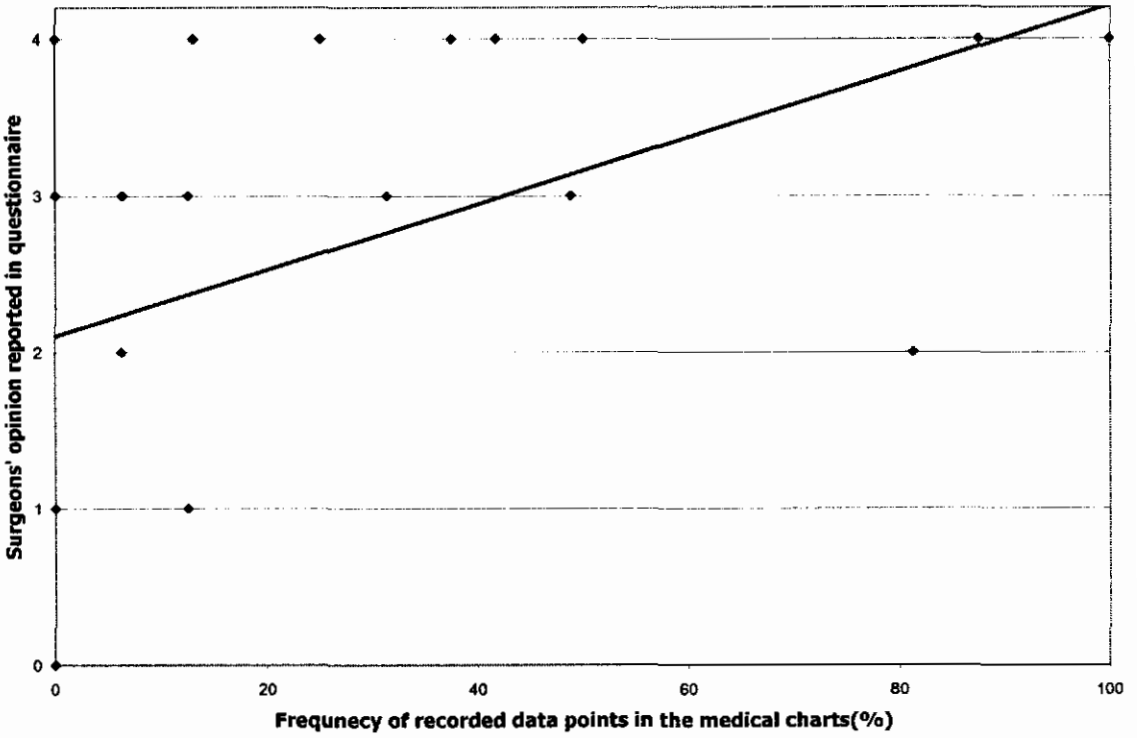


Figure 6- Correlation between What Surgeon Records and Thinks is Important in Managing Breast Care – Surgeon 5 (r=0.27, P value<0.01)

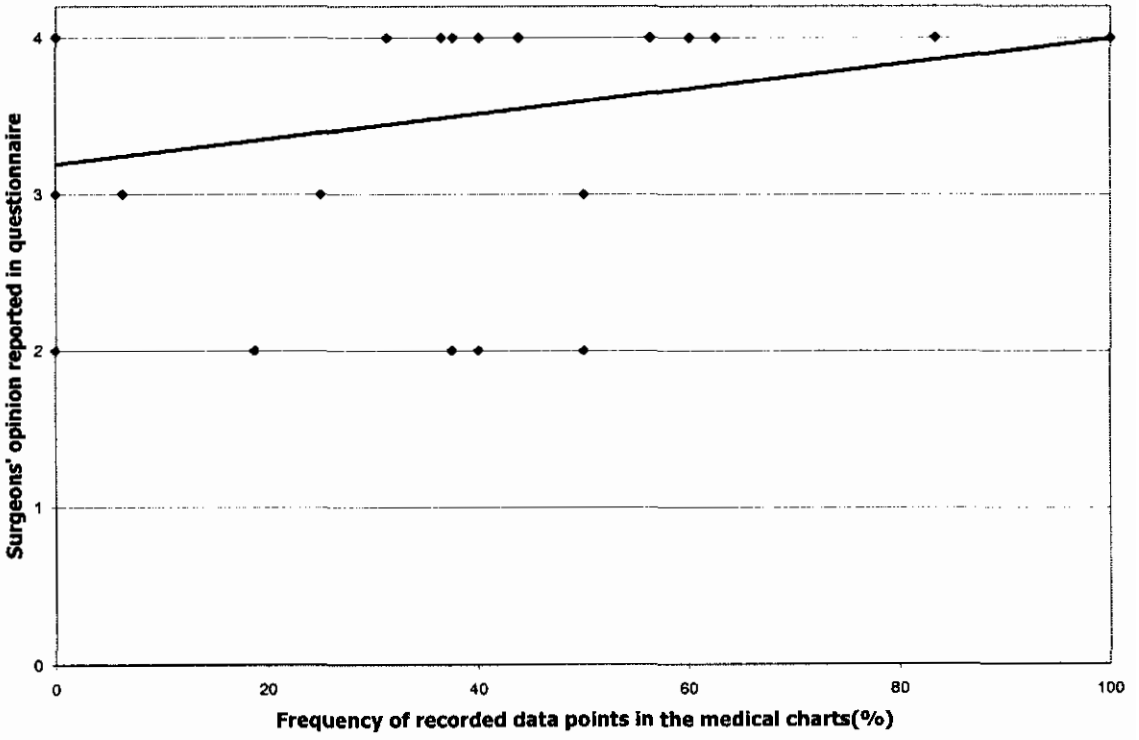


Figure 7 – Correlation between What Surgeon Records and Thinks is Important in Managing Breast care –Surgeon 6(r=0.61, P value<0.01)

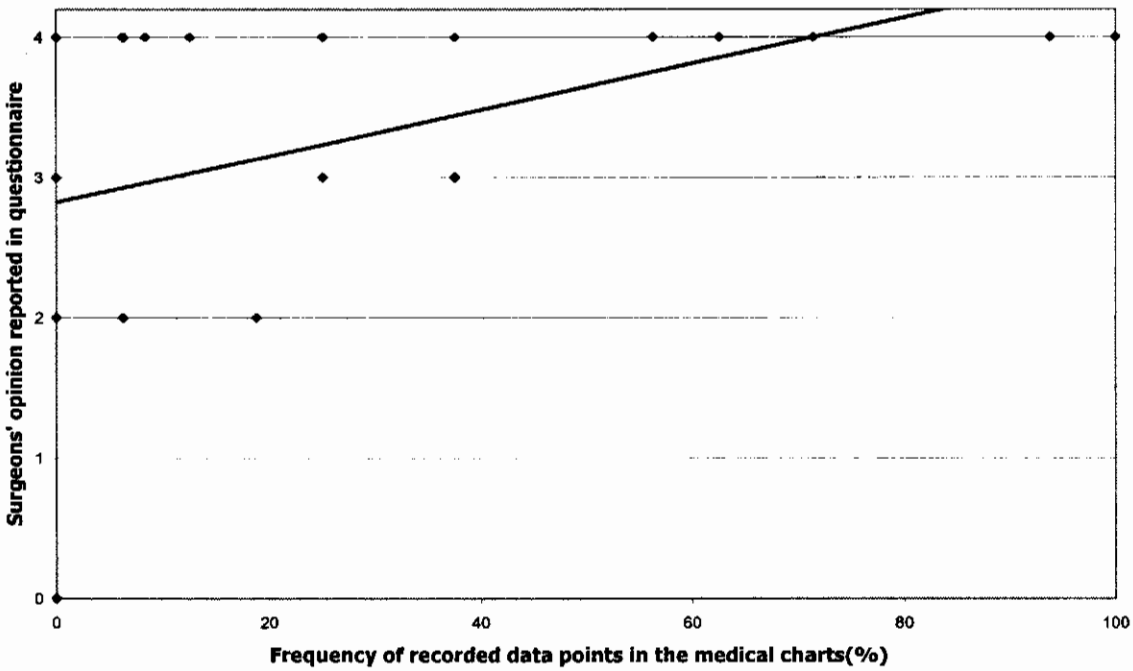
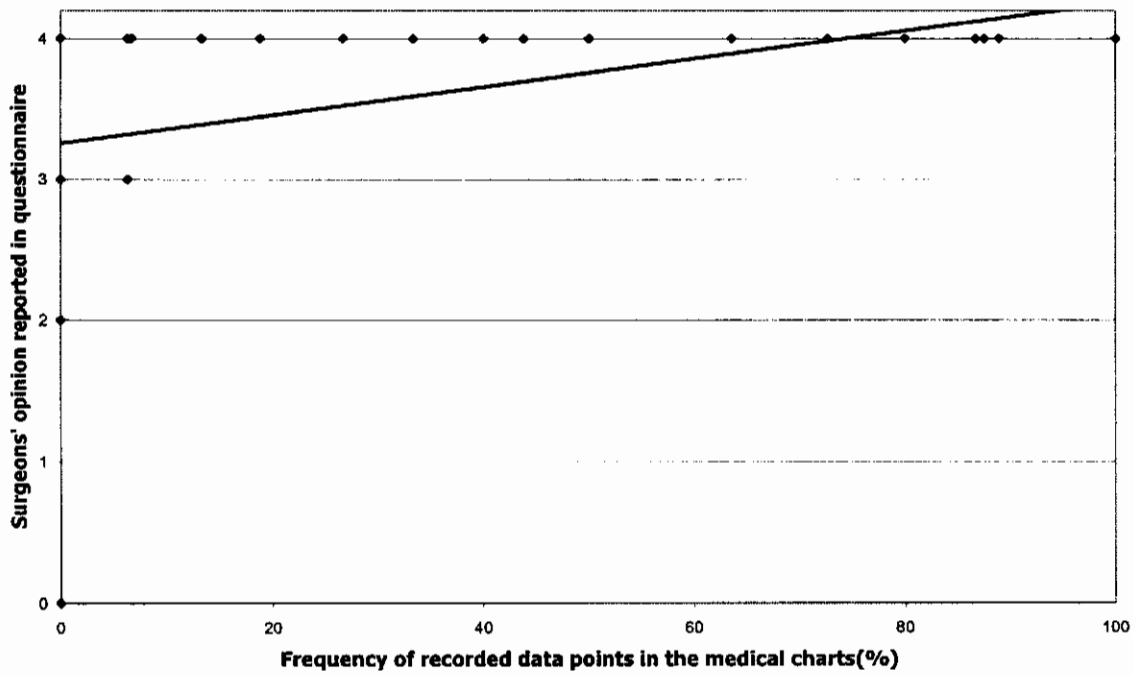


Figure 8 - Correlation between What Surgeon Records and Thinks is Important in Managing Breast Care – Surgeon 7 (r=0.25, P value<0.01)

7



Appendix A – Ethics Approval Letter issued by MUHC - Department of Professional Services (DPS)

Centre universitaire de santé McGill
McGill University Health Centre

September 15th, 2003

Dr. David Fleiszer
Director, Breast Diagnostic Center
S6.14
Royal Victoria Hospital

RE: The impact of Breast Cancer Risk Assessment on Clinical Practice. #030909B.

Dear Dr. Fleiszer::

The impact analysis, the study protocol and worksheet analysis of the above referenced have been reviewed and it is our understanding that this study has no impact on our hospital resources.

Any adverse effects resulting from this drug trial which impacts in any significant way on the hospital resources should be reported to the director of professional services. All investigations, hospitalisations and treatment costs incurred by the MUHC due to an adverse effect of this study should be assumed by the research sponsors.

Please have the Department Chief sign on page 6 of this protocol.

This approval also includes access to review any medical records for the purpose of this study.

If my interpretation of this study's impact is incorrect or requires clarification, please do not hesitate to contact me.

Dr. Françoise P. Chagnon
Director, Professional Services
McGill University Health Centre

FPC/cp

c.c. L. Lavigne
P. Bourgeois

Appendix B – Cover Letter for Questionnaire for Assessment of Surgeon's Opinion

In your usual practice of diagnosing and treating breast disease, what issues do you routinely address during a patient's initial encounter?

Please rank each of the following items with following scale:

Always, Very often, Sometimes, Rarely, Never

Appendix C – Likert-Scale Questionnaire for Assessment of Surgeon's Opinion

Risk factors and past history	Always	Very often	Some-times	Rarely	Never
Age of patient					
Gravida					
Parity					
Aborta					
Age of menarche					
Age at first live birth					
History of breast-feeding					
Age of menopause					
History of Endometrial cancer					
History of other Cancers					
History of breast self exam					
Last menstrual period					
Regularity of periods					
General medications					
Diabetes and Hypertension					
Drug allergy					
Previous breast cancer					
Hysterectomy and Oophorectomy					
Exogenous Estrogen: HRT					
OCP					
Chemoprevention (Tamoxifen, etc.)					
Previous mammogram					
Past Medical History					
Family history					
Family History of breast cancer					
Age at which breast cancer diagnosed					
Family history- Current age or age of death					
Family history of other cancers					
Family History of ovarian cancer					
Current History of breast disease					
Lump					
Tenderness					
Pain					
Nipple discharge					
Fine needle aspiration					
Breast surgery (including biopsy)					
Cough, bone pain, weight loss, etc.					
Physical examination					
General description (size, symmetry, etc.)					
Skin (dimpling, counter regularity, etc.)					
Nipple areola complex					
Breast Size					
Glandular texture					
Nodularity					
Luminosity					
Degree of tenderness					
Description of mass					
Lymph nodes					
Description of lymph nodes position, size, etc.)					
Nipple discharge					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