

Impact of Student Practicums on Sonography Clinics & Hospital Departments in British Columbia: A Project

**by
Tatym Schneider**

Diagnostic Medical Sonography, BCIT, 2012

Project Submitted in Partial Fulfillment of the
Requirements for the Degree of
Master of Education

in the
Educational Leadership Program
Faculty of Education

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SIMON FRASER UNIVERSITY
Summer 2022

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Declaration of Committee

Name: Tatym Schneider

Degree: Master of Education (Leadership)

Title: Impact of Student Practicums on Sonography Clinics & Hospital Departments in British Columbia: A Research Project

Committee:

Chair: Rebecca Cox
Associate Professor, Education

Michelle Pidgeon
Supervisor
Associate Professor, Education

Tina Fraser
Committee Member
Adjunct Professor, Education

Michelle Nilson
Examiner
Associate Professor, Education

Ethics Statement

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Abstract

As part of the education to become a Diagnostic Medical Sonography Technologist, students must complete a mandatory 4-term practicum at designated sites. Educational institutions that offer DMS Programs work together with practicum sites to identify available student placement spots. Sites can choose to refuse to participate or limit the number of students that they take on. However refusal is detrimental to both the educational programs and the students who rely on these sites for their clinical education. This study uses a cost-benefit analysis to explore the outcomes of hosting students for clinical placements in the DMS departments of hospitals and private clinics throughout British Columbia. Using an online survey of clinical placement coordinators from all the BC health districts, it was learned that the overall burden to hosting clinical placements on number of patients seen in a day, or on the preceptors time, was minimal. And in many cases a financial benefit is present. While some sites do suffer a relatively small financial burden, the researcher speculates that this is caused by variation in site policies. Based on the findings this researcher recommends that further study be done into the policies around student clinicals in order to better understand and boost the financial outcome for all sites.

Keywords: clinical practicum; cost/benefit analysis; healthcare education; sonography; education policy; healthcare policy

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1. Introduction

Status of Sonography Education in British Columbia, Canada

Sonography is a diagnostic medical examination that uses high-frequency sound waves (i.e. ultrasound) to see inside the body. A Diagnostic Medical Sonography (DMS) technologist is a skilled healthcare professional who uses ultrasound equipment to create and record images of the internal organs, to be used by physicians for medical diagnosis and treatment. In Canada there is currently a shortage of DMS technologists, resulting in long wait times for patients who are in need of sonography exams (Beamish, 2021; Lirette, 2019).

In British Columbia, there are currently three Diagnostic Medical Sonography educational programs. The DMS program offered by the College of New Caledonia (CNC) is a typical representation. It consists of a 24-month diploma program, which includes three semesters of theory on campus, and four terms of clinical practicum ("Diagnostic Medical Sonography", 2022). The four terms of practicum are spread across a variety of different sites throughout British Columbia. During the student's time out in clinical they will initially, in the first term, only be permitted to scan patients while under direct supervision. This oversight will gradually reduce as the student's skills improve, until during their fourth term, they will be functioning with significantly reduced supervision and performing interchangeably with other sonographers at that site. Practicums are crucial to the DMS educational programs and a large part of student training occurs off campus, at both private imaging clinics and hospital imaging departments within British Columbia. Unfortunately, due to a recent increase of DMS programs in the province - from one to three - many sites feel overwhelmed with the number of requests they receive to take on students. Many sites express a reluctance to accept students, and can refuse to take on a clinical practicum. This is quite concerning, because without the voluntary participation of clinical sites, students training to be sonographers will be unable to access the required number of practicum hours they need to graduate. A successful practicum experience for students is reliant on a successful supervisory experience for clinical instructors (Peetoom & Nuttgens, 2019).

Based on anecdotal feedback, the DMS program at CNC learned some of the reasons that sites often state for refusing to participate in student practicums. These include being understaffed, overworked, having too long a patient waitlist, and not being able to afford to book down for student training. The practice of 'booking down' is the pre-emptive decrease in the number of patients a site accepts during a student's term there. The general tenor of the anecdotal feedback is that the presence of a student is an operational burden, while the only perceived benefit of taking on this burden is the possibility of recruiting the student. Of course, students are not required to accept a position at the sites where they complete their practicum, which makes practicums an uncertain recruiting tool. Other than the possibility of recruitment, sites are not compensated in any way by either the Canadian government or the post-secondary institution (PSI) that the student is attending.

Questioning Established Assumptions & Perspectives of DMS Practicums

In this study, I wished to more closely explore the perception that practicum students place an operational burden on participating sites. Through a cost-benefit analysis, I attempt to quantify the operational burden of a student practicum as loss of business, due to a decrease in the number of patients served during the practicum. And also identifying a number of related questions, which include: Are the claims of clinical practicum sites accurate? Are students a net loss for a sonography department? Is it possible that students may be a net gain? Or that they may even have no long term effect on sites, either positive or negative? Is this reported burden an actual financial burden which can be measured, or only a perceived burden? Do all sites experience a uniform burden, or is there any variance in this burden from term to term or from site to site? If there is any variance, are there any insights that can identify the root causes behind them?

In order to contextualize these questions, it may be necessary to approach the subject at two levels. First, at the level of the individual student and how a student is perceived and managed at an individual site. And second, at the level of the established system, and the structures - both material and philosophical - that govern our medical institutions.

The Outsider: A Role In-Between Student and Sonographer

A student going through a clinical practicum is recognized to be at a somewhat in-between stage. They are more than a student and not yet a graduated healthcare professional. While they still pay tuition to the college they are enrolled in, they pay a reduced amount (Fee Schedule, 2021). And they are not at the campus for this portion of their learning, so are removed from the typical student body. Therefore they are not exactly a student, or perhaps, not the same kind of student as the rest of the students are. Similarly, during the practicum, while the student works for the sonography department at the site where they are completing their practicum, they are not a full-fledged employee. First of all, this is because they are not paid for their work. And secondly, it is because they do not complete the same amount of work or work entirely independently during this time.

In the beginning of their clinical terms, students start out needing more time and attention from their clinical instructors/supervisors. And as their skills and confidence develop they are then able to work more and more independently. If they complete their practicum education successfully, they can become a resource for the clinical site in the form of free labour. In this way, it is possible that students can become net positive, or at least have zero net effect (no gain but also no overall loss) for a clinical site. This however, is not guaranteed, and therefore a practicum term may be better viewed as trial employment instead.

Therefore, practicum students are not the same kind of employees as the rest of a typical sonography department's employees, which impacts the way they are utilized. Research has found that clinical instructors form impressions and make judgements on student clinical competence based on student performance, humanistic behaviors and personal qualities, making this an already very subjective experience (Bowman, Harreveld, & Lawson, 2022). The ambiguous nature of who the student reports to and where the student belongs (i.e. are they a student or are they an employee?), and the fact that there are no uniform policies, or many different approaches and perspectives regarding the leadership and management of practicum students (Johnson, 1986; Yoo, Yoo, Park, & Son, 2017), can make their organization and administration more difficult.

Furthermore, the fact that a student may complete their four practicum terms at multiple different sites also compounds this difficulty.

Ultimately, from a site's perspective, not only do students lack the skills to be considered a fully trained sonographer, they also don't quite belong to the team at the site. This makes it much more likely for the practicum student to be labelled as a burden rather than a resource. Such labelling is consistent with the lived experience of students and the anecdotal feedback of clinical instructors, where the sense is much more that a student is lucky to have a practicum, rather than that a site is lucky to have this student, a new enthusiastic temporary employee, who is working for free.

Structure of Healthcare in Canada and Profitability Concerns

Moving onto the second level of analysis of the structure of our medical and educational systems, this resource-burden dialectic becomes even more important, especially when our education as well as our healthcare systems are contemplated in relation to profit. Canadian healthcare is presented as a government service rather than a for-profit endeavour, where an estimated 70% of healthcare costs are paid publicly, by the government, and the remaining 30% is paid privately, by the patients (Born & Laupacis, 2011). Practically all sonography services fall into the public healthcare realm. While framing sonography as a government service may make one think that operating sonography departments and clinics would have little to do with seeking profit, this would be an incorrect assumption. In practice, regardless of the source of payment, hospitals and clinics operate as if they were independent businesses, and ultimately exist in a competitive frame where each individual site competes for space, patients and human resources. One need not look far to see evidence of this framing – a quick review of government documents and publications will reveal the government explicitly praising and taking credit for “pro-competitive policies” in its healthcare governance (“Canada's Health Care Sector”, 2020). The understanding is that competition within the healthcare sector drives innovation and efficiency.

Competition among sites makes it clear why they worry about recruiting the students they train, and why sites consider a practicum student taking a job with another sonography site to be a major negative. Many clinical sites view practicums with the

expectation that the benefit to them will be the recruitment of the student. And the primary aggravation stated by sites is that students took a job at another site instead, making them feel that the practicum did not achieve their recruitment goal. Regardless of the private or public labels, in a free market with capitalist assumptions - which our healthcare system is embedded within simply as a consequence of existing within our financial system - it can be assumed that all institutions are either intentionally or reluctantly, pursuing profit and its maximization. This not only necessitates competition for resources as well as competition for business, but also ultimately results in the practicum experience being evaluated through a resource-burden lens.

Here, some might object that Canadian healthcare is not pursuing profit. They may even note that among Canadian healthcare providers, 95% of hospitals and clinics are owned and operated by non-profit institutions (Fuller, 1998). While on the surface, this may make it look like profit is not a driving motive for hospital or clinic management, it would also be a mistake to make such an assumption. In fact, a non-profit designation does not prevent an institution from operating as a profit-seeking enterprise. Through outsourcing and joint ventures, Canadian healthcare providers are already finding mechanisms for becoming profitable to investors (Fuller, 1998). And even if one argues that healthcare - or any other word that ends with 'care' for that matter - should not be guided by the pursuit of financial profit as its primary goal, one has to concede that it must still remain a necessary goal. For all healthcare providers, profitability is a key consideration for management. This is because, regardless of the moral considerations of profit in the context of providing care, profitability - making more than what is spent - is required simply to keep a healthcare operation viable and sustainable over the long run.

The importance of site profitability becomes even more apparent when we consider the relationship between the government, which funds healthcare, and the healthcare service providers, who do the actual work of providing that healthcare. In Canada, hospitals and clinics employ healthcare professionals and pay salaries from their own internal budgets. The bulk of the payments that make up these budgets come from the Canadian government, which primarily pays these institutions using a fee-for-service model, where the healthcare department invoices the government for services rendered (Tikkanen, Osborn, Mossialos, Djordjevic, & Wharton, 2020). This basically

means, from an accounting perspective, that each sonography technologist, or department of sonography technologists, are effectively self-employed small businesses, where the Canadian government is the chief client. In this context, they must operate profitably in order to continue functioning. If they become too unprofitable for too long, they will cease to exist. Therefore, profitability is an existential material concern for DMS hospitals and clinics. If an effective solution is to be found for the shortage of practicum sites, the profitability of sonography sites, including the profitability of their clinical practicums, must also be considered.

2. Literature Review

Existing literature on the analysis of the fiscal cost/burden of sonography practicums is noticeably limited. However there are a few studies that examine the various other aspects of the sonography practicum experience, clinical placements in other healthcare disciplines, such as nursing, and studies related to the education of healthcare practitioners in real world healthcare settings. While this literature can be used to gather insights and draw conclusions related to this study, there are, however, two prominent challenges in relating this study to the current literature .

The first challenge is that, overall, the available research is more focused on the student experience and the effect of on-the-job training on the student, rather than the impact of the student (fiscal or otherwise) on the site where the training is performed. In other words, the literature focuses more on the student, and the student's education, and less on the site and their financials. Secondly, these studies paint a complex picture of professional education in a healthcare setting, which makes it difficult to draw clear conclusions and reduce the training experience into a simple gain/loss analytic, let alone a cost/benefit number to which a dollar figure can be attached.

Nevertheless, a sufficiently thorough review of relevant literature highlights three high level points that are worthy of discussion. The three main themes which emerge from the literature review are how clinical placements are perceived as a burden, the limited research around fiscal impact of student clinical placements and how student utilization is unreliable due to practicum management.

1.1 Clinical placements are perceived as a burden

With the growth of healthcare educational programs in BC comes the need for an increased number of clinical practicum placements, which are globally becoming challenging to find (Taylor, Angel, Nyanga, & Dickson, 2016). Part of this challenge is, according to "The process and challenges of obtaining and sustaining clinical placements for nursing and allied health students" (Taylor, Angel, Nyanga, & Dickson, 2016), many healthcare practitioners are less likely to take students due to the

perception that hosting a student clinical will slow down their patient exams and consultations, which would negatively affect the income they could generate. In other words, clinical placements are perceived as and are assumed to be a fiscal burden to the sites that host them, which is a perception that is in line with the anecdotal consensus of sonography practitioners.

In fact, it can be argued that the perception of healthcare students as a burden is so deeply ingrained that various studies are often conducted about how this burden can be alleviated. For instance, “Establishing nurse practitioner clinical practicums: Addressing fiscal realities” (Delaney, Swartwout, Livesay, & Bavis, 2019), discusses a “pay-for-precepting” model in nursing, where clinical preceptors are financially compensated for taking on a student. And “Paying for nursing student clinical placements, ethical considerations” (Copeland, 2020), analyzes the advantages, disadvantages and challenges of attaching an explicit financial incentive to practicum sites to take on students. Such discussions have already moved beyond the question whether a practicum is a financial benefit or burden, and instead, operate from the assumption that practicums are a burden. This approach, however, is a deficiency in the literature, as the actual fiscal impact of sonography practicums is mostly unknown, as explained below in the second emergent theme.

1.2 Limited research around fiscal impact of student clinical placements

There are very few studies that actually examine the fiscal impact of practicum students on sites, either in the practice of sonography or in nursing or other related healthcare areas. A study titled “Limited Obstetric Ultrasound Examinations: Competency and Cost” (Stringer, Miesnik, Brown, Menei, & Macones, 2003), determined the time per nurse, and dollar cost, required to establish a limited obstetric ultrasonography (LOBU) program, where sonography assessments in obstetric settings could be taught. In this study, the total cost of education was worked out by determining the salaries and benefits of both the nurse being educated and the expert nurse sonographer doing the training. It came out to be between \$1,433.84 to \$1,037.55 per nurse, depending on the class size of instruction. This study is relevant because in using

the findings from this study it is possible to extrapolate the entire cost of a sonography practicum training and come up with an estimate for the financial burden of sonography practicums.

Another project done by Jones and Akehurst (2001) called “The cost and value of pre-registration clinical placements for Project 2000 students”, reported that nursing and midwifery students spent 64% of their time in clinical practicums engaged in activities of value to the site, while their mentors/supervisors spent 21% of their time with a student engaged in student-related activities. The findings of this study can be used to come up with more specific estimates of costs as well as benefits. What is of note in the Jones and Akehurst study is that it shows how students can be seen as a resource rather than a drain, and that the time students spend with patients and on patient care can be quantified by applying a payment rate to the relevant number of hours to determine the financial benefit of a student in a clinical practicum.

Besides these two studies, the literature review did not reveal any information relevant to the fiscal impact of student practicums in the healthcare realm. In fact, the deficiency of studies is actually noted in “Costs and benefits of providing undergraduate student clinical placements for a health service organization: A rapid review” (Bowles, Haines, Molloy, Kent, Sevenhuysen, & Tai, 2014). This review of publications and reports remarks that there had never been a thorough investigation into the actual costs and benefits of clinical placements for healthcare programs. While there have been studies speculating on the likely costs-benefits of hypothetical student placements, as well as fiscal projections made while planning future programs, according to Bowles, Haines, Molloy, et al. (2014) studies into the real world fiscal impacts of healthcare student practicums is lacking.

1.3 Student utilization is unreliable due to practicum management

Despite the assumption that practicums are a burden, both Jones & Akehurst (1999) and Bowles, Haines, Molloy, et al. (2014) suggest that long-term clinical placements can be cost neutral or even beneficial to a clinical site and that students have the ability to support the sites they are learning at. This is because student

productivity falls on a spectrum, which not only varies from student to student, but also varies over time as each student develops key skills throughout their practicum. Although a student can at first negatively impact a site, throughout the practicum time, as students begin to work faster and with a larger range of skills/tasks, the student begins to positively impact the site instead (Bowles, Haines, Molloy, Kent, Sevenhuysen, & Tai, 2014).

Nevertheless, according to “Establishing nurse practitioner clinical practicums: Addressing fiscal realities” (Delaney, Swartwout, Livesay, & Bavis, 2019), whether or not a practicum becomes a financial burden or a financial benefit depends on the details. There are no established rules or trends that apply to the practice of healthcare practicums in general, nor sonography practicums in specific. Therefore, setting up practicums with the expectation of net financial benefit as a result of skill development over time is unreliable.

The unreliable or low level of student productivity during practicums raise a number of questions around the management of practicums, and the systemic, leadership, and mentoring components of hosting students at healthcare sites. There are some indications in the literature that these areas have deficiencies that should be studied and improved.

For instance, “Preceptoring a student in the final clinical placement: reflections from nurses in a Canadian Hospital” (Bourbonnais & Kerr, 2007) reveals limited support from program advisors, with some participants remarking that managers did not seem to plan ahead of time with their staff to support the preceptor. “Building organizational capacity for effective mentorship of pre-registration nursing students during placement learning: Finnish and British mentors' conceptions” (Jokelainen, Jamookeeah, Tossavainen, & Turunen, 2011), identified that managers were not well equipped to establish protected time to spend on student mentorship activities, or take it into consideration for their staff. To build better capacity for effective mentorship of healthcare students – according to this study - there was a need for an organized strategy that invests in human and financial resources, utilizing mentor preparation programs, a positive mentorship culture and the establishment of procedures to provide quality preceptor learning opportunities and support.

Ultimately, the review of the literature creates the inevitable sense that, while student practicums in healthcare are taken seriously by the educators, they are approached in an ad-hoc manner by the partnering healthcare sites, creating an environment that lacks unified managerial standards as well as a clear understanding of the task at hand. The fact that cost-benefit studies are lacking can also be seen as an additional indicator of a lack of attention by the sites, which in turn creates space for the prejudice that “students are a burden” – a prejudice that dominates the current cultural consensus.

3. Methodology

1.1 Research Purpose and Questions

The purpose of this study was to gather data on the costs and benefits associated with sonography practicums for sites in British Columbia.

The primary research questions posed were: Are sonography student practicums profitable for the hospitals and clinics that participate in them? Moreover, are they profitable for the entirety of the practicum year or are some terms profitable while others cause a loss?

1.2 Context of Research

Any sonography site within British Columbia that had hosted a student practicum either currently, or in the past, were included in this research study. This included sonography sites in both hospitals and private clinics. Excluded sites were those who had not recently participated in a practicum placement. There were a total of 18 publicly available email addresses that the invitation letter was sent to.

1.3 Research Design

1.3.1 Participant Recruitment

The survey participants included sonography supervisors/managers, clinical instructors/liasons, and sonography technologists currently employed at a hospital or clinic that hosts sonography practicums. Participants were encouraged to share the invitation email and survey link with other sonographers who met the participation requirements and might be interested in contributing as well. This explains how 22 survey responses were gained from 18 contact emails.

All participants were informed that their identity would be protected, and that the results from the survey would be stripped of any personally identifiable information. They were also informed that the researcher was conducting this study as a student of Simon

Fraser University, and not as an employee of the College of New Caledonia, a BC Health Authority, the Department of Health, Department of Education or Sonography Canada.

1.3.2 Survey Design

To answer the research question, this study used an online survey to gather data on the costs and benefits associated with sonography practicums in British Columbia. This survey asked 20 questions (See Appendix B) of participants about their personal experiences with sonography practicum students.

To measure the impact of sonography practicums, the relationship between the costs (or financial burden), and the revenues (or financial benefit) of having a student was clearly defined. For the purposes of this study, the costs associated with having a practicum student was defined as patients lost. During a practicum, patients can be lost due to a variety of reasons unrelated to the practicum student. Therefore, this definition of 'Patients Lost' is strictly limited to patients lost as a direct consequence of hosting a student practicum. This can be a result of "booking down" - the common practice of proactively limiting the number of available spots for patients that day - as well as a result of overall slowdown, caused by sonographers who supervise the student scanning a lower number of patients than they otherwise would have due to their supervisory duties.

For the purpose of this study, the revenues associated with having a practicum student can be defined as 'Patients Gained', purely as a result of the student's presence. Here, 'Patients Gained' is defined as the additional number of patients the student is able to independently scan for the site. Since the students are not financially compensated for performing these scans, any patient scanned by a student is a net revenue benefit to the site. The net profitability of a practicum was defined in terms of the net gain or loss of patients. A practicum is deemed profitable, over a period of time, if during that time the site gains more patients than they lose as a result of the student. A practicum is not profitable, over a period of time, if the site loses more patients than they gain.

To determine the number of patients lost, the survey asked: “How many patients are booked down due to the presence of a practicum student and are an effective loss for the site?” To determine the number of patients gained, the survey asked: “How many patients does the student scan independently and gain for the site?”

In asking these questions, it was important to hedge against anchoring and negativity biases. Survey participants could be influenced by their initial experience of a student during their first clinical term (anchoring bias), and misperceive their skill development across the entire practicum, or give disproportionate weight to the burdens of hosting a student (negativity bias). This necessitated asking questions that measured facts as specifically and objectively as possible, and for each of the four clinical terms to be measured independently. Moreover, considering the fact that the performance of the student is a continuum which varies across the four clinical terms, where during the first term the student needs to be constantly supervised and is unable to scan independently, and during the final term the student practically functions as a staff sonographer, asking the research question for each term independently provided a more accurate portrayal of the practicum experience. Therefore, rather than asking the question for the entire practicum, it was more productive to ask the two questions shown above, a total of four times, once for each clinical term. The survey also had a variety of questions around the self-perception of the clinical preceptor role, experience of working with practicum students, compensation, overall impact of practicums, and three open ended questions regarding opinions about practicums (Appendix B - Survey Questions). These questions were primarily meant to gain supplemental insights, and potential inspiration for future research.

1.3.3 Research Process

Once the survey was set up on www.surveymonkey.ca, participating sites (See Appendix D - Solicited Sites) were contacted with an email invitation letter (See Appendix C - Invitation Email) using publicly available email addresses. There were 18 sonography contacts identified from publicly available data. Snowball recruitment was also encouraged in the Invitation Email, with the hope that further sonography contacts would be reached in that manner.

The solicitation email included a description of the study as well as a link to the survey, and was sent by the Administrative Assistant for the School of Health Sciences at the College of New Caledonia. The survey asked for consent before questions were administered (see Appendix E - Consent Form), and it received a total of 22 responses with an average completion rate of 68%. It was optional, not required, for respondents to answer each of the survey questions, hence the 68% completion rate of the survey.

1.3.4 Ethical Considerations

Ethics approval for the study was required before participation could be sought from potential participants. Due to the scope of the project, with data being gathered from sonography sites throughout all of British Columbia, the ethics review process had to go through the Health Research Ethics Board (HREB) of BC. This allowed for each of the individual health authorities of British Columbia to be informed and give permission for employees within their district to be approached. These health authorities included: Vancouver Island Health Authority, Fraser Health Authority, Interior Health Authority, and Northern Health Authority.

As well as ethical approval, each health authority had to give their operational approval for the research project. This was accomplished by applying individually to each district and fulfilling their specified requirements.

In terms of ethical considerations for the participants, there were not determined to be any adverse consequences for participation in the survey, nor for refusal to participate. All collected data will be kept confidential and private. Data or analysis published will only be presented in the aggregate and be completely anonymized. It will not be possible to infer or reverse engineer information about the sites or participants who contributed to this study.

As some of the questions in the survey require personal reflection, answering these had the potential to upset a participant, or cause them difficulty. Therefore in order to further minimize any potential risks to participants, the survey was designed to allow questions to be skipped as preferred. This accounts for the 68% completion rate of the survey.

1.4 Research Analysis

Once the data was collected, the financial impact of a given sonography practicum was calculated as the net patients (gained or lost) during a clinical term, for each of the four practicum terms, as well as for the entire practicum at each site. Here, the Net Patients is defined as the total number of patients independently scanned by the student during their terms (See Appendix B - Survey Questions 10, 11, 12, and 13) defined as Patients Gained, minus the total number of patients booked down or lost (See Appendix B - Survey Questions 6, 7, 8, and 9) as a consequence of the practicum term defined as Patients Lost. (See Formula 1 below)

Formula Set 1:

$$\text{Net Patients per Day} = \text{Patients Gained per Day} - \text{Patients Lost per Day}$$

The survey asked for a report of daily metrics, to estimate the actual Net Patients for a given term, so the reported results of daily patients gained/lost needed to be multiplied by 5 to match the standard 5-day work week at sonography sites to calculate Net Patients Per Week.

Formula Set 2:

$$\text{Net Patients Per Week} = \text{Net Patients Per Day} \times 5$$

$$\text{Patients Gained Per Week} = \text{Patients Gained Per Day} \times 5$$

$$\text{Patients Lost Per Week} = \text{Patients Lost Per Day} \times 5$$

Once Net Patients Per Week is calculated, this number needs to be multiplied by the total number of weeks that constitute a given clinical term. Currently, Term 1 is four weeks, Term 2 is fifteen weeks, Term 3 is ten weeks, and Term 4 is ten weeks. Therefore, to calculate net patients the following formulas were used:

Formula Set 3:

$$\text{Term 1 Net Patients} = \text{Term 1 Net Patients Per Week} \times 4$$

$$\text{Term 2 Net Patients} = \text{Term 2 Net Patients Per Week} \times 15$$

$$\text{Term 3 Net Patients} = \text{Term 3 Net Patients Per Week} \times 10$$

$$\text{Term 4 Net Patients} = \text{Term 4 Net Patients Per Week} \times 10$$

4. Research Findings

1.1 Findings

Out of 22 respondents, there were 15 that provided sufficient numerical data to analyze the Net Patients for their site. From this data it was determined that a total of 8652.5 patients were lost, while 8412.5 patients were gained, resulting in a net of 240 patients lost as a result of practicums in total. Table 1.1 below shows actual Net Patients across all terms, by multiplying Daily Net Patients by number of days in each term. The Daily Net Patients version of the same table can be found in Appendix A, Table 1.4.

Table 1.1. Net Patients Across 4 Terms For All Sites

Sites	Term 1	Term 2	Term 3	Term 4
A	-120	-450	-150	0
B	-80	0	200	200
C	-10	112.5	75	125
D	-20	75	100	250
E	0	0	0	0
F	20	150	150	200
G	0	0	0	0
H	-20	-75	-50	-50
I	0	0	0	0
J	-30	-112.5	-50	150
K	0	0	50	100
L	0	225	250	400
M	0	0	0	0
N	-40	-450	-100	50
O	-140	-525	-350	-350
P	20	225	250	350
Q	-60	-225	0	0
R	0	0	250	500
S	-160	-600	-400	-100
Total	-640	-1650	225	1825
Grand Total				-240
Average Patients Lost Per Site over all 4 Terms				-12.63

Patients Lost per day was reported as 49.5, 49.5, 41 and 38 patients for Terms 1 through 4 respectively, with a Total Patients Lost of 178 patients per day. (See Appendix A, Table 1.6. & Figure A1) Using these reported results, Total Patients Lost is calculated for each of the four practicum terms. It shows that Total Patients Lost is 990, 3715.5, 2050 and 1900 for Terms 1 through 4 respectively, with a Combined Total Patients Lost of 8652.5 patients. (See Appendix A, Table 1.7. & Figure A2)

Net Patients Gained per day was reported as 17.5, 27.5, 45.5 and 74.5 patients for Terms 1 through 4 respectively, with a Total Patients Lost of 165 patients per day. (See Appendix A, Table 1.8. & Figure A3). Using these reported results Total Patients Gained for each of the four practicum terms was calculated. It shows that the Total Patients Gained was 250, 2062.5, 2275, and 3725 for Terms 1 through 4 respectively, with a Combined Total Patients Gained of 8412.5 patients. (See Appendix A, Table 1.9. & Figure A4)

1.2 Observations

A number of interesting observations can be made from the data. First, on the whole, practicums are breaking even between net loss and net gain. The survey results report that there are a total of 240 patients lost as a result of practicums with an average of 12.63 patients lost per site. This net loss represents only 2.7% ($240 / 8652.5 \times 100$) of total patients lost, or 2.9% ($240 / 8412.5 \times 100$) of total patients gained across an entire practicum year for the participating sites.

As of May 2016, approximately 650 people worked as Medical Sonographers in British Columbia, according to the Canadian Government's Job Bank ("Job Bank", n.d.). Based on industry practices, it can be assumed that about 30% of these sonographers would be involved with practicums, resulting in a population size of 195 medical sonographers that can be viable participants in this study's survey. Using a margin of error calculator based on a normal distribution with population size 195 and a sample size 19, a margin of error of 29% is reported. ("Margin of Error", n.d.) This is in line with sample size and survey accuracy recommendations from www.surveymonkey.com as well (Graglia, n.d.). Using a 29% margin of error, a minimum of 2509.2 (29% of 8652.5)

patients would need to be lost, or 2439.6 (29% of 8412.5) patients would need to be gained, before accepting a conclusive gain or loss. Therefore, the results are well within the margin of error and are inconclusive to declare a loss or gain.

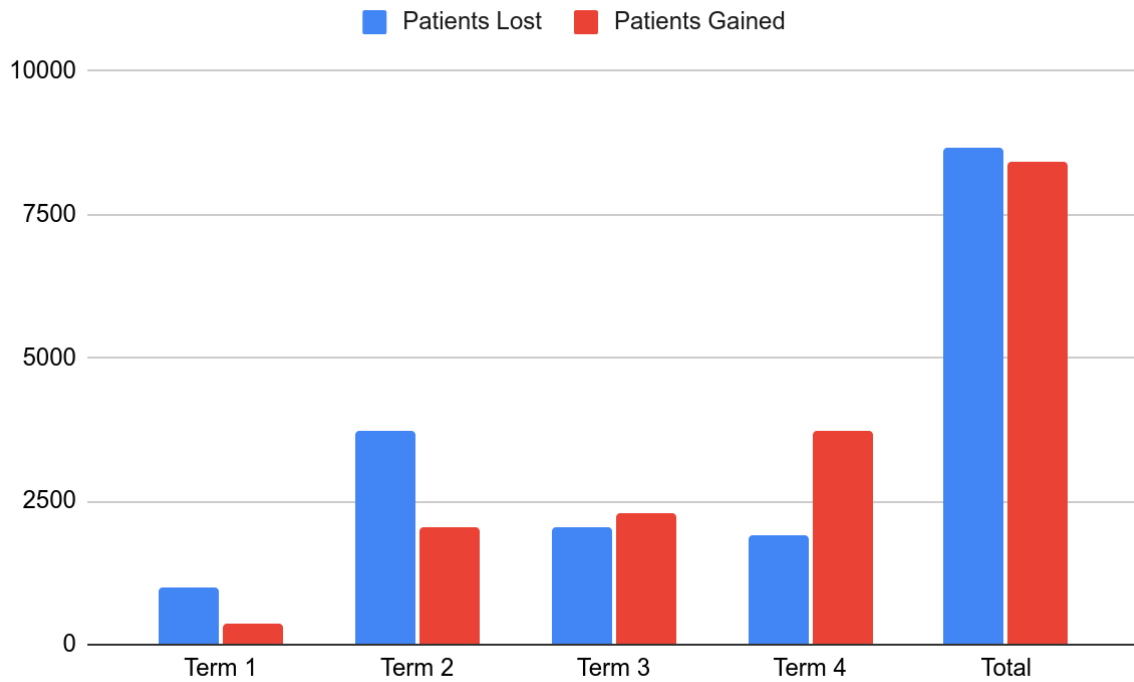
Of course, it should be noted that even if the study had statistical significance, it still would not be measuring actual cost/benefit in the form of patients lost or gained, but instead, would be measuring participant's memories and experience of the number of patients lost or gained with greater accuracy. In order to get an accurate picture of the actual cost/benefit, the actual financials of the sites would need to be examined.

Taking a conservative estimate of 13,000 patients scanned per clinic per year (assuming 5 techs per site, and 10 patients scanned per tech), even if the reported 240 patients lost was perfectly accurate, it would still only amount to 0.097% of total scanned patient volume for participating sites. That means, the slight loss of patients is inconsequentially small. Ultimately, we can conclusively state that neither gains nor losses above the margin of error were reported, and the reported slight losses are inconsequentially small. This means that the practicum experience could reasonably be interpreted as breaking even. As a related note, these results may justify the current lack of involvement or policy direction of the government. A total of 12.63 patients lost per site per practicum year may not justify dedicating government resources towards it.

Second, in Figure 1 it can be seen that there is a change in the number of patients gained throughout the four clinical terms of the full practicum year.

Figure 1. Patients Lost & Patients Gained Visual Comparison - Total Count

The following figure illustrates a comparison of the patients lost with patients gained, for each of the practicum terms as well as for the entire practicum experience as the "Total" column. (See Appendix A, Figure 1ALT for the daily version)



Third, as Table 1.2 below shows, the average variance of patients lost term over term is 17638.54 whereas the average variance of patients gained term over term is 33768.12. (Appendix A - Table 1.5. shows the same calculations for Daily Net Patients, Tables A5 show variances for Patients Lost/Gained, and Tables A6 shows variances for Daily Patients Lost/Gained)

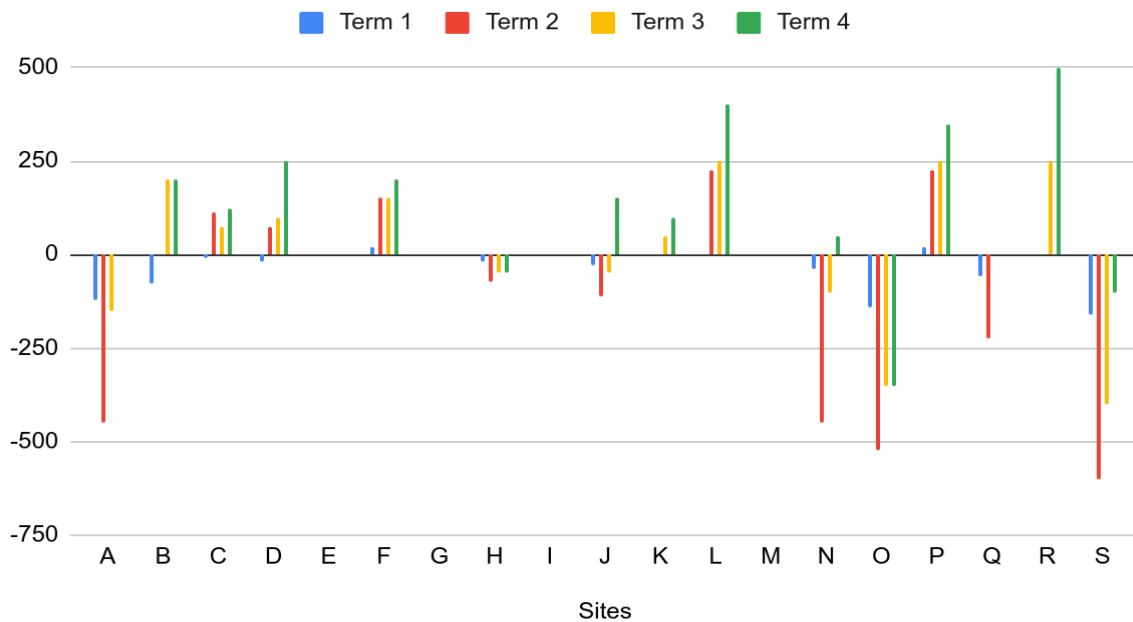
Table 1.2. Variances Among Net Patients For The Entire Practicum Experience

SITES	Term 1	Term 2	Term 3	Term 4	Term 1 to Term 4 VARIANCE
A	-120	-450	-150	0	36600.00
B	-80	0	200	200	20266.67
C	-10	112.5	75	125	3709.90
D	-20	75	100	250	12506.25
E	0	0	0	0	0.00
F	20	150	150	200	5933.33
G	0	0	0	0	0.00
H	-20	-75	-50	-50	506.25
I	0	0	0	0	0.00

J	-30	-112.5	-50	150	12701.56
K	0	0	50	100	2291.67
L	0	225	250	400	27239.58
M	0	0	0	0	0.00
N	-40	-450	-100	50	47900.00
O	-140	-525	-350	-350	24806.25
P	20	225	250	350	19172.92
Q	-60	-225	0	0	11306.25
R	0	0	250	500	57291.67
S	-160	-600	-400	-100	52900.00
Site to Site Variance	2902.34	61570.72	32525.58	38073.83	
Site to Site Average Variance				33768.12	
Term to Term Average Variance					17638.54

Fourthly, when plotting the Total Net Patients for each site over the entire practicum experience, the following figure can be seen:

Figure 2. Net Patients For Each Site Across Each Term



And lastly, one additional interesting observation can be made from the data. Question 3 asks “How many sonography students have you interacted with, in total, over your entire career?”. There are a variety of answers ranging from 7 to 50+, meaning the participants have a wide range of experience. Here, it is reasonable to assume that the more experienced participants will have greater accuracy in their responses because their greater experience will allow them to draw from a larger sample size. Based on this assumption, the number of students a participant has worked with can be used to count their answers with greater weight. To achieve this numerically, the number of students a participant has worked with can be used as a Weight Multiplier, as shown in the formula below:

Formula 4:

$$\text{Weighted Net Patients} = \text{Net Patients} \times \text{Weight Multiplier}$$

Using the weight multiplier we get the following table:

Table 1.3. Weighted Net Patients Across Sites

Site	Weight (i.e. # of students)	Unweighted Net Patients	Weighted Net Patients
A	40	-720	-28800
B	50	320	16000
C	35	302.5	10587.5
D	30	405	12150
E	0	0	0
F	50	520	26000
G	0	0	0
H	50	-195	-9750
I	0	0	0
J	50	-42.5	-2125
K	50	150	7500
L	45	875	39375
M	0	0	0
N	25	-540	-13500
O	8	-1365	-10920
P	10	845	8450
Q	7	-285	-1995
R	36	750	27000

S	12	-1260	-15120
Total	498	-240	64852.5
Weighted Net Patients Per Practicum Student			
			130.23
Weighted Net Patients for All (19) Participants			
			2474.29

As can be seen above, while the Total Unweighted Net Patients shows 240 patients lost as a consequence of practicums, the Total Weighted Net Patients show 64852.5 patients gained.

Of course, the Unweighted Net Patients is a count of Net Patients for a total of 19 practicums (19 participants), whereas the Weighted Net Patients is a measure of the total of 498 practicum students participants have worked with throughout their entire career. Therefore, by dividing the Total Weighted Net Patients result with the total number of practicum students it represents, Weighted Net Patients Per Practicum Student can be found to be 130.23 patients. And to create a comparable number with the 240 patients lost among the participants, Net Patients Per Practicum must be multiplied with the total number of participants in this table (19), yielding 2474.29 patients gained in total. Therefore, if the reports from experienced participants are given prominence, instead of 240 patients lost, 2474.29 patients would have been gained. This is a significant difference. In other words, if the reports of the participants who have greater experience have more weight, practicums are found to be a significant net benefit instead of a loss.

5. Discussion

Based on the findings outlined above, DMS student practicums across the province are either breaking even, or are slightly profitable for the hospital and clinic sites that host them. Whether they are interpreted to be breaking even or profitable depends on the method of data analysis. If the response from every participant is counted equally, as Table 1.1 shows, an average of 12.63 patients are found to be lost per site per practicum. This loss is only a tiny fraction (0.097%) of the total estimated scanned patients for these sites, which is well within the margin of error, and can therefore be read as breaking even.

If however, responses from the participants are weighted by the number of practicums they have participated in (using Question 3 - “How many sonography students have you interacted with, in total, over your entire career?”), as Table 1.3 shows, an average of 130.23 patients are found to be gained per site per practicum – which is still small, but outside the margin of error, so a gain worthy of consideration. This is perhaps the most interesting finding in the study and leads to the following insight:

Insight 1: Experienced participants report notable profitability with practicums

There are two ways to read this insight. First, it could mean that, despite the consensus bias that students are a burden, practicums are actually profitable for sites, and the more experienced survey participants are simply reporting this fact more accurately. Here, it is reasonable to assume that the more experienced participants will have greater accuracy in their responses, because their greater experience will allow them to draw from a larger sample size. Alternatively, it could also mean that the more experienced participants are better at utilizing students, and are therefore both experiencing and reporting greater profitability from practicums. Of course, it is possible for a combination of both, as well as some additional factor to be influencing these findings. Regardless, it is clear that experienced participants are reporting notable gains through practicums.

A second insight emerges from observing the change of Net Patients reported by the practicum sites over time:

Insight 2: Student skill development is evident in Net Patients.

As shown in Figure 1, the number of Patients Gained increases as the terms progress, which is an expected result of student skill development over time. This is in line with the reporting from Bowles, Haines, Molloy, et al. (2014), as well as Jones and Akehurst (1999): As students develop their skills through clinical terms 1 to 4, they work faster and accomplish a larger range of tasks, ultimately positively impacting the site.

Here, however, it is worth noting that the measurable impact of this skill development is less significant than site choice. This can be seen when comparing term to term variance in Net Patients for each site, with the site to site variance in Net Patients. (See Table 1.2 in Findings). Site to site average variance is 1.9 times greater than term to term average variance ($33768 \div 17639$), which could be interpreted as: Impact of student skill development in Net Patients is about half the impact of site choice. Another way to read this is that the difference of Net Patients for a student who is untrained at term 1, and trained at term 4, would have been less than the difference of Net Patients for the same student, if they were assigned to a different site.

An additional supporting observation can also be made when the survey results are grouped across sites, rather than across terms. As Figure 3 showed (see Findings), sites that gain patients during a student clinical, tend to continue to gain them across all four of the clinical terms. Whereas sites that lose patients, tend to lose them across all four clinical terms. Only two sites (B & D) had a net negative in the first term, but flip to net positive results in the following terms. In the light of these facts, a third insight emerges: the site a practicum occurs at will have the largest impact on the net patient outcomes for a given clinical.

Insight 3: Site choice determines profitability of practicums

With the significant variance observed among sites (Table 1.2) and the persistence of site performance across terms (Figure 3), it is reasonable to state that,

primarily, site choice determines the profitability of practicums. Of course, the specific cause of this should be investigated.

While speculative, this large variation among sites is likely a result of their internal managerial practices and policies. This is also in line with Delaney, Swartwout, et al. (2019), highlighting their notion that whether or not a practicum becomes a financial burden or a financial benefit depends on the details of practicum management, which vary from site to site, since there are frequently no uniform guidelines for practicum management in BC.

It is also interesting to note that, similar to Bowles, Haines, Molloy, et al. (2014), an increase in Net Patients as the terms progress was expected (and observed), but this increase was not enough to flip the balance of net patients for sites that start at a loss. This can be interpreted as another point of evidence for the notion that the varying outcomes are due to the operational policies of the sites, their management style, or other factors related to the running of the site. This interpretation becomes even more clear in the light of Bourbonnais and Kerr (2007), which state that managers may not be capable of planning properly, as well as Jokelainen, Jamookeeah, Tossavainen, et al. (2011), which state that managers were not well equipped for student mentorship – meaning not all sites are able to productively utilize a student, regardless of student skill development.

Of course, it is worth noting that student performance, and the capacity of each student to scan, does vary from student to student. This however, does not contradict any of the points articulated above. The survey asked about practicums in general, rather than the last student a site hosted. And the respondents had interacted with a large number of practicum students (See Appendix B - Survey Questions, Question 3), with the lowest being 7 students (1 participant), and the highest being 50 (5 participants reported 50, and the 5th reported greater than 50 students). Therefore, because participants had considerable experience with practicums, it can be assumed that their responses were in relation to practicums in general rather than a specific student – meaning that the disparate outcomes reflect differences in sites rather than students.

Ultimately, similar to Delaney, Swartwout, Livesay et al. (2019), there are no established rules or trends that can be unilaterally applied to all sonography practicums, as the biggest difference in net patient outcomes seems to be the site itself.

1.4 Limitations

There are two major limitations with this study. The first one is the sample size - only 22 sites responded, and only 19 of them supplied usable data on the financial impact of practicums. The second one is the nature of the quantitative questions - the survey asked for an estimate of patients lost and patients gained from the participants, rather than asking for actual logs or financial data. Therefore, this study should be considered preliminary research to determine whether a more thorough analysis of the actual data should be conducted. Considering the fact that sonography sites are paid per exam done for each patient, and that they keep detailed records of such, an exact study of the actual profit/loss of a sonography practicum could be calculated with relative ease. Furthermore, considering the negative bias towards practicum students and the perception that they are a drain on sites, it is possible, and perhaps even likely, that bookdowns have been over-reported and extra patient scans under-reported.

As a final note, in many of the calculations in this study, a number of assumptions are made, including but not limited to five day workweeks, the number of weeks in a term, the consistency of the practicum process year over year and past length of clinical terms. In a complete cost/benefit analysis, these assumptions should be overcome, and exact figures calculated.

1.5 Significance of Study

The general consensus in the sonography community is that student practicums present an undue financial burden to hospitals and clinics. This not only makes finding practicum placements difficult, but it also creates a culture of resistance toward students which can have negative impacts on education. This study shows that practicums are effectively breaking even (with the unweighted results) and possibly a net fiscal benefit (with the weighted results) for participating sites. Finally, and perhaps most importantly,

the fact that there is a large variance among sites in terms of Net Patients, indicates that it is possible for some sites to benefit from practicums. Best practices from these sites who handle practicums productively could be studied, standardized and shared across all sites, turning practicums into a net positive experience for all sites involved.

1.6 Further Study

Three further studies are suggested. First, the analysis presented here was limited to survey questions 3, 6, 7, 8, 9, 10, 11, 12, and 13 (See Appendix B - Survey Questions). Survey results for the rest of the questions should be examined and analyzed to see if other useful insights can be drawn. Second, a cost/benefit analysis to measure the exact financial impact of practicums should take place, to validate this study's findings and to get accurate data. Finally, a study of net patient winners should take place to identify best practices, which can then be used to create educational material for all practicums sites.

1.7 Conclusion

Sites that participate in sonography clinical practicums report a variety of financial outcomes with significant variance in Net Patients gained or lost as a consequence of their practicums. This variance is likely attributed to a confluence of factors related to the operation of individual sites, including past teaching experience of staff, managerial capacity on site and book-down policies. On average, ignoring sites' level of experience with practicums, a slight loss in net patients scanned is reported. This reported number is close to break-even. If sites' level of experience is used to estimate net patients, a significant net gain from practicums is shown. Further studies are recommended, including an actual cost/benefit analysis of practicums, conducted using accounting data from participating sites, in order to get a more accurate picture of the financial impact of DMS practicums in BC.

Ultimately, practicums can be a financial burden as well as a net financial gain for participating sites. This is hopeful, because it opens the possibility to education of sites, generation of best practices as well as province wide initiatives that can improve the

experience of practicums. The fact that practicums can be a financial benefit is an optimistic piece of evidence, and also, a potential incentive for sites to take on more practicum students. While not definitive, it is reasonable to conclude that practicums can be a financial benefit for sites, as well as a financial loss. Which it is depends on the site, their protocols and actions.

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Appendix A. Tables

Table A.1. Net Patients Across 4 Terms For All Sites - Per Day

The table below lists the total number of patients gained/lost for each clinical term (1-4) of each site survey answer, as well as the combined total patients gained/lost of all clinicals.

Sites	Term 1	Term 2	Term 3	Term 4
A	-6	-6	-3	0
B	-4	0	4	4
C	-0.5	1.5	1.5	2.5
D	-1	1	2	5
E	0	0	0	0
F	1	2	3	4
G	0	0	0	0
H	-1	-1	-1	-1
I	0	0	0	0
J	-1.5	-1.5	-1	3
K	0	0	1	2
L	0	3	5	8
M	0	0	0	0
N	-2	-6	-2	1
O	-7	-7	-7	-7
P	1	3	5	7
Q	-3	-3	0	0
R	0	0	5	10
S	-8	-8	-8	-2
Total	-32	-22	4.5	36.5
Combined Total				-13

Figure A.1. ALT - Patients Lost & Patients Gained Visual Comparison - Per Day

This figure is showing the same data as Table 1.4. just in a more visual format. The blue bars represent the number of patients lost per day in each clinical term. The red bars represent the number of patients gained per day in each clinical term. And the total number of patients lost and gained over all 4 clinical terms.

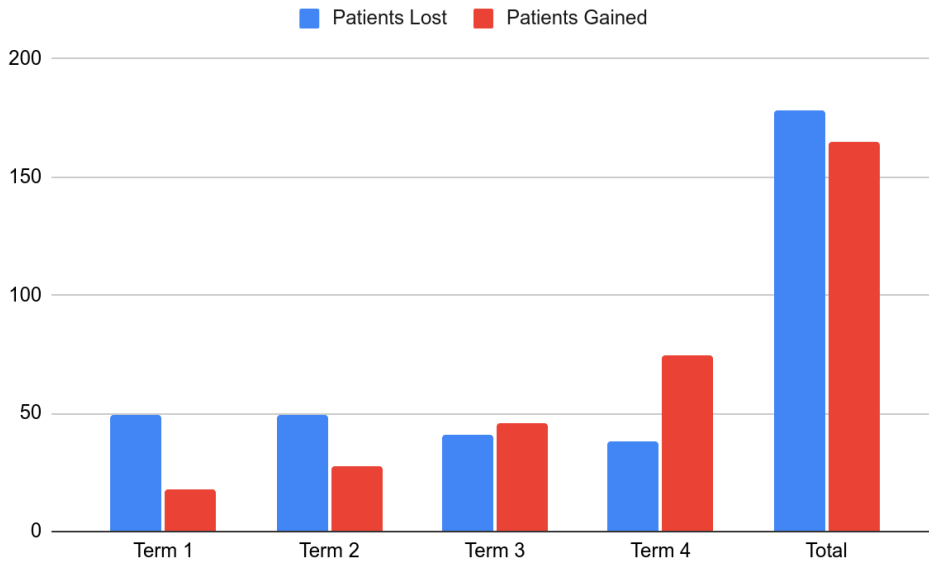


Figure A.2. ALT – Net Patients Among All Sites

This figure displays the net patients gained/lost at all sites over all terms of an entire practicum.

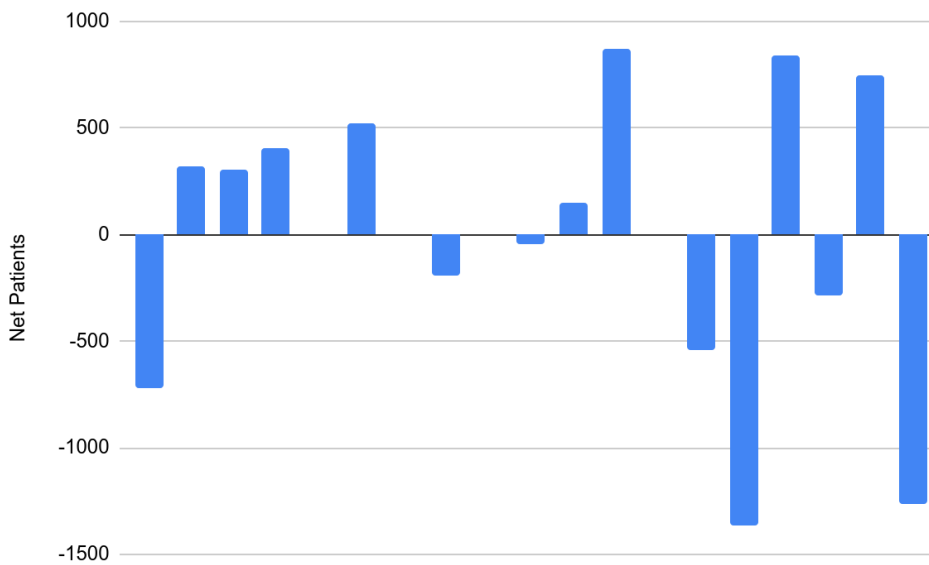


Table A.2. Variances Among Daily Net Patients

Variance measures the average degree to which each point differs from the mean. The higher the variance listed below, the larger amount of difference there is from the average. In this table we can see that the site to site average variance is greater than the term to term average variance.

SITES	Term 1	Term 2	Term 3	Term 4	Term 1 to Term 4 VARIANCE
A	-6	-6	-3	0	8.25
B	-4	0	4	4	14.67
C	-0.5	1.5	1.5	2.5	1.58
D	-1	1	2	5	6.25
E	0	0	0	0	0.00
F	1	2	3	4	1.67
G	0	0	0	0	0.00
H	-1	-1	-1	-1	0.00
I	0	0	0	0	0.00
J	-1.5	-1.5	-1	3	4.75
K	0	0	1	2	0.92
L	0	3	5	8	11.33
M	0	0	0	0	0.00
N	-2	-6	-2	1	8.25
O	-7	-7	-7	-7	0.00
P	1	3	5	7	6.67
Q	-3	-3	0	0	3.00
R	0	0	5	10	22.92
S	-8	-8	-8	-2	9.00
Site to Site Variance	7.26	10.95	13.01	15.23	
Site to Site Average Variance				11.61	
Term to Term Average Variance					5.22

Table A.3. Patients Lost Per Day Across 4 Terms (Reported Results)

This table has listed all of the sonography patients that were lost (not able to be booked for a scan) per day, due to clinical practicum terms 1-4. The Patients Lost per day was reported as 49.5, 49.5, 41 and 38 patients for Terms 1 through 4 respectively, with a Total Patients Lost Across all 4 Terms to be 178 patients per day.

Site	Lost Term 1	Lost Term 2	Lost Term 3	Lost Term 4
A	6	6	6	6
B	10	8	6	6
C	3	2	2	2
D	1	1	1	0
E	0	0	0	0
F	2	2	2	2
G	0	0	0	0
H	1	1	1*	1
I	0	0	0	0
J	1.5	1.5	1	1
K	0	0	0	0
L	0	0	0	0
M	0	0	0	0
N	2	6	4	3
O	7	7	7	7
P	5	4	3	2
Q	3	3	0	0
R	0	0	0	0
S	8	8	8	8
Total	49.5	49.5	41	38
Combined Total				178

* The original answer was missing, but could be inferred to be 1 based on answers on 1st, 2nd and 4th terms.

Figure A.3. Patients Lost Per Day Across 4 Terms (Reported Results)

This figure is showing the same data as Table 1.6. just in a more visual format. The blue bars here represent the sonography patients that were lost per day (not able to be booked in for a scan) in clinical practicum terms 1-4 for all 19 participating sites. Patients lost are highest during clinical terms 1 and 2 and then are shown to be lower during clinical terms 3 and 4.

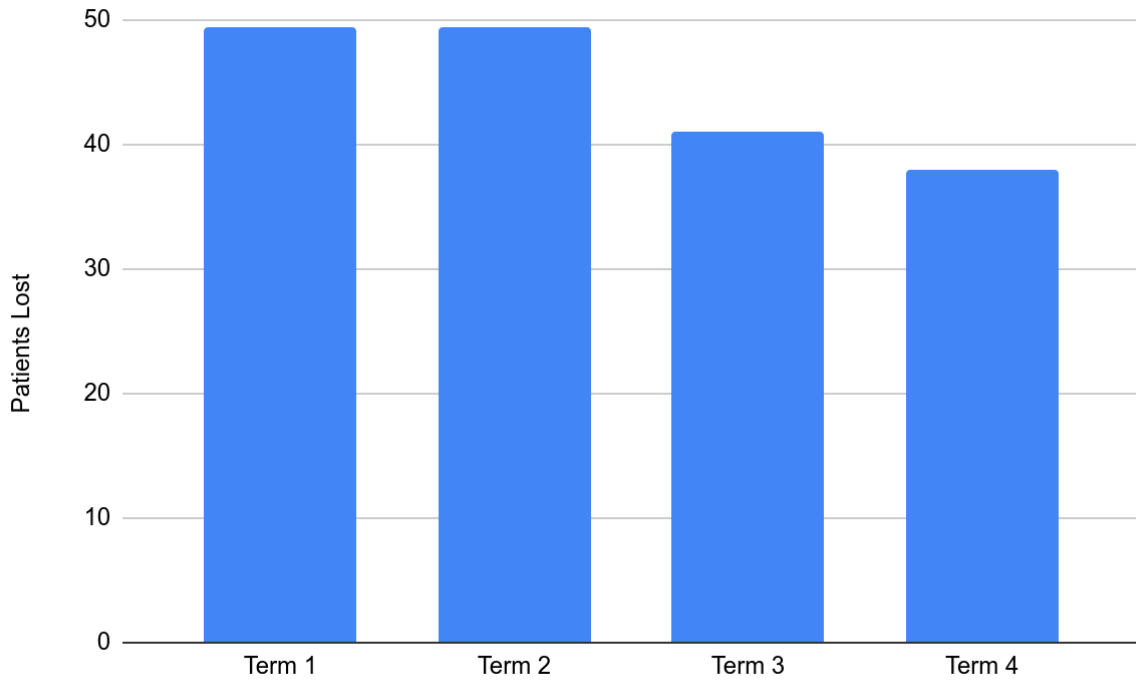


Table A.4. Total Patients Lost Across 4 Terms (Calculated Results)

Using Patients Lost per day (from Table 1.6.) the Total Patients Lost is calculated for each of the four practicum terms. It shows that the Total Patients Lost is 990, 3715.5, 2050 and 1900 for Terms 1 through 4 respectively, with a Combined Total Patients Lost of 8652.5 patients.

Site	Lost Term 1	Lost Term 2	Lost Term 3	Lost Term 4
A	120	450	300	300
B	200	600	300	300
C	60	150	100	100
D	20	75	50	0
E	0	0	0	0
F	40	150	100	100
G	0	0	0	0
H	20	75	50	50
I	0	0	0	0
J	30	112.5	50	50
K	0	0	0	0
L	0	0	0	0
M	0	0	0	0
N	40	450	200	150
O	140	525	350	350
P	100	300	150	100
Q	60	225	0	0
R	0	0	0	0
S	160	600	400	400
Total	990	3712.5	2050	1900
Combined Total				8652.5

Figure A.4. Total Patients Lost Across 4 Terms for All Sites

In this figure the blue bars represent all of the sonography patients that were lost (not able to be booked for a scan) in clinical practicum terms 1-4 for all 19 participating sites.

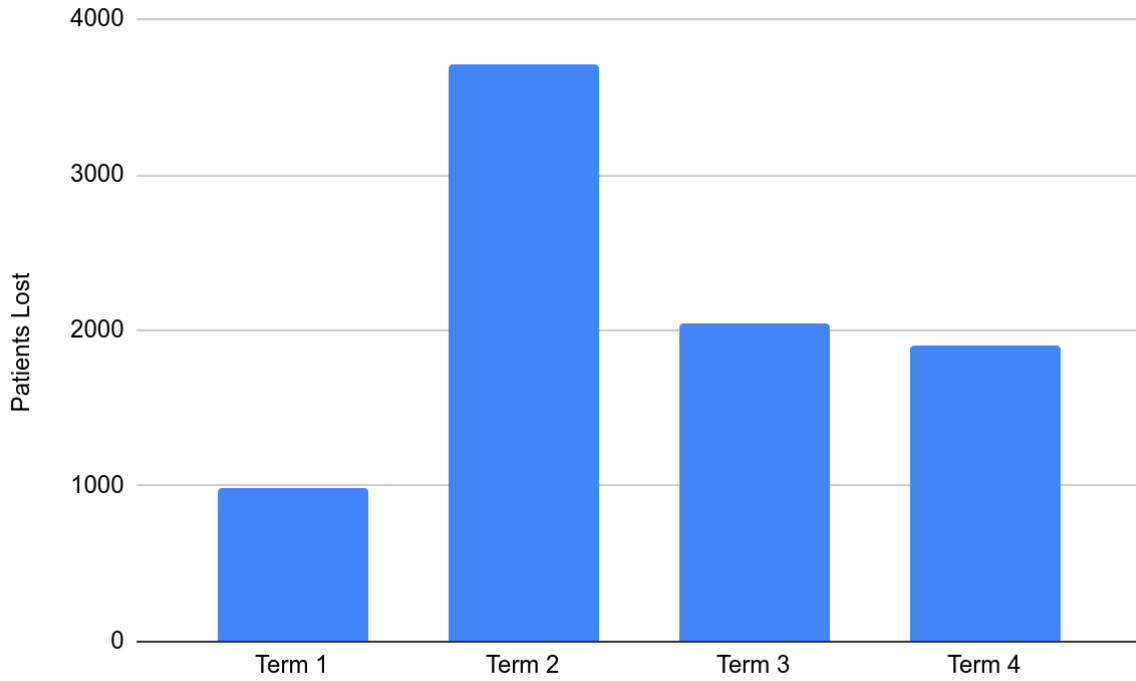


Table A.5. Patients Gained Per Day Across 4 Terms (Reported Results)

This table has listed all of the sonography patients that were gained (scanned independently by the student) per day, in clinical practicum terms 1-4. The Patients Gained per day was reported as 17.5, 27.5, 45.5 and 74.5 patients for Terms 1 through 4 respectively, with a Combined Total Patients Gained of 165 patients per day.

Site	Gained Term 1	Gained Term 2	Gained Term 3	Gained Term 4
A	0	0	3	6
B	6	8	10	10
C	2.5	3.5	3.5	4.5
D	0	2	3	5
E	0	0	0	0
F	3	4	5	6
G	0	0	0	0
H	0	0*	0*	0
I	0	0	0	0
J	0	0	0	4
K	0	0	1	2
L	0	3	5	8
M	0	0	0	0
N	0	0	2	4
O	0	0	0	0
P	6	7	8	9
Q	0	0	0	0
R	0	0	5*	10*
S	0	0	0	6
Total	17.5	27.5	45.5	74.5
Combined Total				165

* original answers were 2 & 8 for terms 2 and 3, but 4th term answer invalidates these numbers, therefore assuming 0

** originally 40% & 80% for term 3 and term 4 respectively. For our calculations, we assumed an average of 12 patients per day, which is in line with industry standards.

Figure A.5. Patients Gained Per Day Across 4 Terms (Reported Results)

In this figure the blue bars represent the daily count of sonography patients from Table 1.8, that were gained (scanned independently by the student) in clinical practicum terms 1-4 for all 19 participating sites.

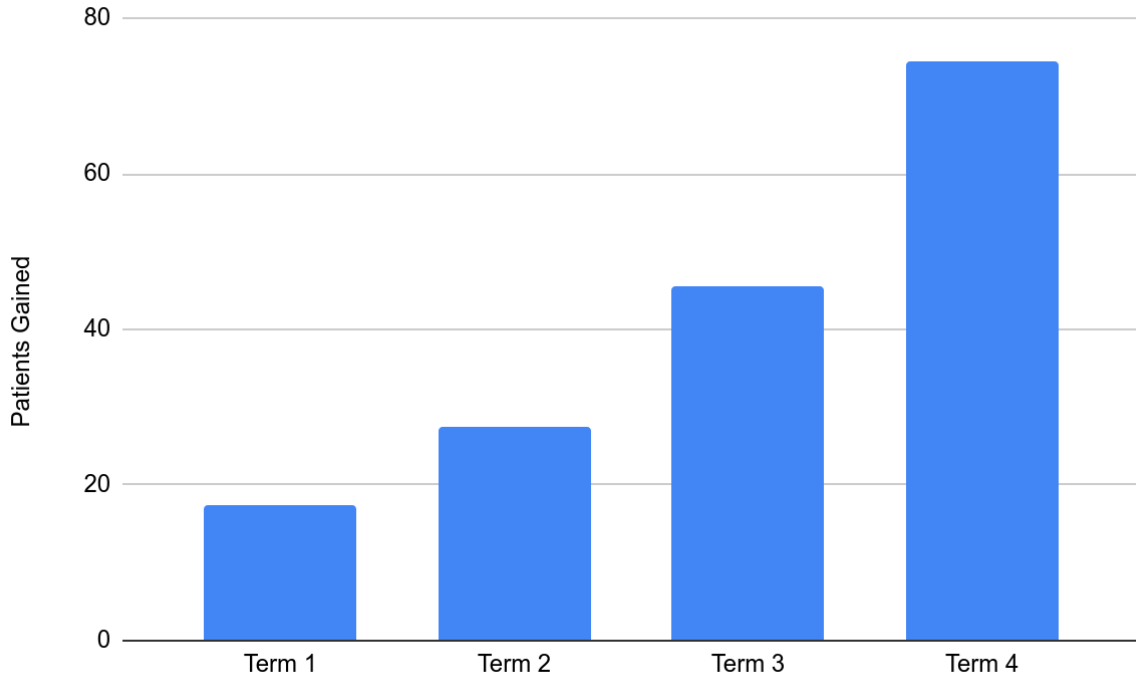


Table A.6. Total Patients Gained Across 4 Terms (Calculated Results)

Using results from table 1.8., the Total Patients Gained is calculated for each of the four practicum terms. It shows that Total Patients Gained is 350, 2062.5, 2275, and 3725 for Terms 1 through 4 respectively, with a Combined Total Patients Gained of 8412.5 patients.

Site	Gained Term 1	Gained Term 2	Gained Term 3	Gained Term 4
A	0	0	150	300
B	120	600	500	500
C	50	262.5	175	225
D	0	150	150	250
E	0	0	0	0
F	60	300	250	300
G	0	0	0	0
H	0	0	0	0
I	0	0	0	0
J	0	0	0	200
K	0	0	50	100
L	0	225	250	400
M	0	0	0	0
N	0	0	100	200
O	0	0	0	0
P	120	525	400	450
Q	0	0	0	0
R	0	0	250	500
S	0	0	0	300
Total	350	2062.5	2275	3725
Combined Total				8412.5

Figure A.6. Total Patients Gained Across 4 Terms for All Sites

In this figure the blue bars represent sonography patients that were gained (scanned independently by the student) in clinical practicum terms 1-4 for all 19 participating sites. Data from Table 1.9. above.

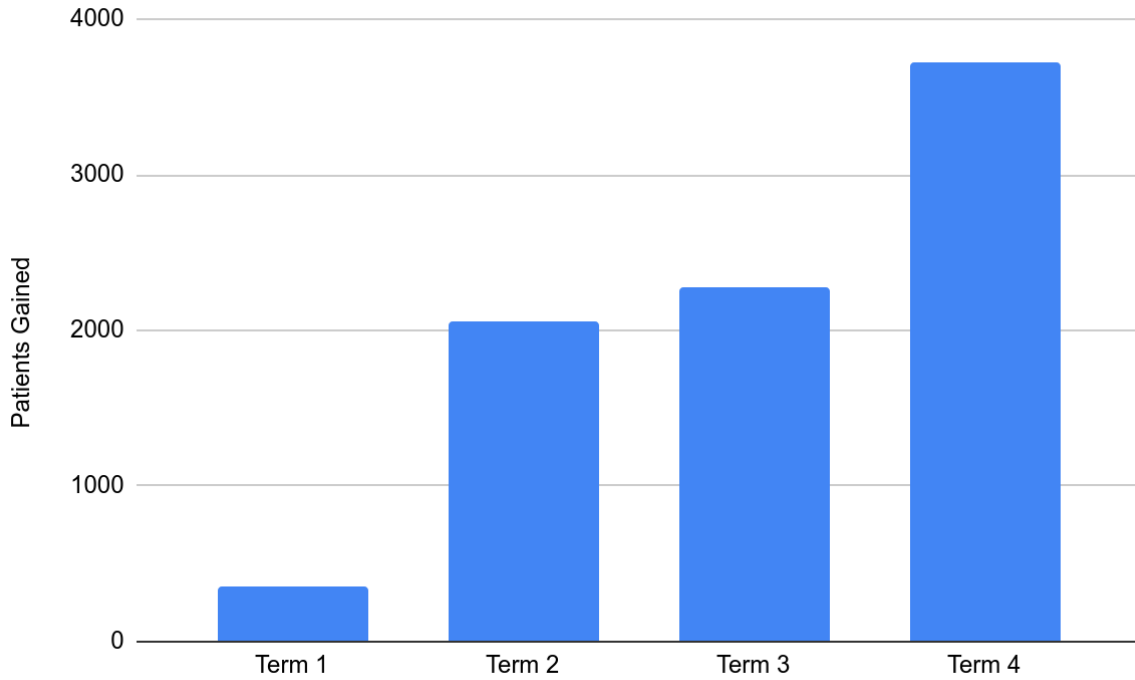


Table A.7. Variance of Patients Lost/Gained – Over All 4 Clinical Terms

Variance measures the average degree to which each point differs from the mean. The higher the variance listed below, the larger amount of difference there is from the average. This table shows that site to site variance in patients lost is greater than the term to term variance. Furthermore, it also highlights that site to site variance is significantly larger than to term to term variance in losses, indicating that patients lost have less to do with student skill, and more to do with a site's operational policies, possibly, their book-down policies.

SITES	Lost Term 1	Lost Term 2	Lost Term 3	Lost Term 4	Losses Variance	Gain Term 1	Gain Term 2	Gain Term 3	Gain Term 4	Gains Variance
A	120	450	300	300	18225.0	0	0	150	300	20625.0
B	200	600	300	300	30000.0	120	600	500	500	44933.3
C	60	150	100	100	1358.3	50	262.5	175	225	8580.7
D	20	75	50	0	1089.5	0	150	150	250	10625.0
E	0	0	0	0	0.00	0	0	0	0	0.00
F	40	150	100	100	2025.0	60	300	250	300	13025.0
G	0	0	0	0	0.00	0	0	0	0	0.00
H	20	75	50	50	506.2	0	0	0	0	0.00
I	0	0	0	0	0.00	0	0	0	0	0.00
J	30	112.5	50	50	1284.9	0	0	0	200	10000.0
K	0	0	0	0	0.00	0	0	50	100	2291.6
L	0	0	0	0	0.00	0	225	250	400	27239.5
M	0	0	0	0	0.00	0	0	0	0	0.00
N	40	450	200	150	30066.6	0	0	100	200	9166.6
O	140	525	350	350	24806.2	0	0	0	0	0.00
P	100	300	150	100	8958.3	120	525	400	450	31256.2
Q	60	225	0	0	11306.2	0	0	0	0	0.00
R	0	0	0	0	0.00	0	0	250	500	57291.6
S	160	600	400	400	32400.0	0	0	0	300	22500.0
Site to Site Variance	3895.3	49152.9	18406.4	18333.3		1580.7	35764.8	22956.8	33629.3	
Site to Site Average Variance				22447.0					23482.9	
Term to Term Average Variance					8527.7					13554.47

Table A.8. Variance of Patients Lost/Gained – Daily

This table is the same as Table 1.10., but uses daily patients gained/lost rather than patients gained/lost for the entire practicum year.

SITES	Lost Term 1	Lost Term 2	Lost Term 3	Lost Term 4	Losses Variance	Gain Term 1	Gain Term 2	Gain Term 3	Gain Term 4	Gains Variance
A	6	6	6	6	0.00	0	0	3	6	8.25
B	10	8	6	6	3.67	6	8	10	10	3.67
C	3	2	2	2	0.25	2.5	3.5	3.5	4.5	0.67
D	1	1	1	0	0.25	0	2	3	5	4.33
E	0	0	0	0	0.00	0	0	0	0	0.00
F	2	2	2	2	0.00	3	4	5	6	1.67
G	0	0	0	0	0.00	0	0	0	0	0.00
H	1	1	1	1	0.00	0	0	0	0	0.00
I	0	0	0	0	0.00	0	0	0	0	0.00
J	1.5	1.5	1	1	0.08	0	0	0	4	4.00
K	0	0	0	0	0.00	0	0	1	2	0.92
L	0	0	0	0	0.00	0	3	5	8	11.33
M	0	0	0	0	0.00	0	0	0	0	0.00
N	2	6	4	3	2.92	0	0	2	4	3.67
O	7	7	7	7	0.00	0	0	0	0	0.00
P	5	4	3	2	1.67	6	7	8	9	1.67
Q	3	3	0	0	3.00	0	0	0	0	0.00
R	0	0	0	0	0.00	0	0	5	10	22.92
S	8	8	8	8	0.00	0	0	0	6	9.00
Site to Site Variance	9.74	8.74	7.36	7.33		3.95	6.36	9.18	13.45	
Site to Site Average Variance				8.29					8.24	
Term to Term Average Variance					0.62					3.79

Appendix B. Survey Questions

FINANCIAL IMPACT OF SONOGRAPHY PRACTICUMS ON HOSPITALS AND CLINICS IN BRITISH COLUMBIA

1. In what role have you participated in a student clinical/practicum? (Please check all that apply)

Clinical Instructor or Liaison / Site Manager or Supervisor / Sonography Technologist

2. How many sonography students have you interacted with, in total, over your entire career?

_____ (give number)

3. How many Clinical terms have you been involved with, in total, over your entire career? (A Clinical term is a period of time that is typically 4, 10 or 15 weeks in length where one particular student is located at a particular site.)

_____ (give number)

4. If you are a Clinical Instructor/Liaison or Sonography Technologist please answer the following: How would you describe the impact that working with a student has on your ability to scan patients?

- a. I have scanned fewer patients because of my student supervisory duties
- b. The number of patients I scan has not been noticeably affected by my student supervisory duties
- c. I have scanned more patients as a result of supervising a student

5. For answering the following questions, if you don't have exact numbers, please provide your best guess.

a) On average, when a sonography student is present at your site during their 1st clinical term (May to July), how many patients are booked down per day to accommodate the student?

_____ # of patients per day

b) On average, when a sonography student is present at your site during their 2nd clinical term (January to March), how many patients are booked down per day to accommodate the student?

_____ # of patients per day

c) On average, when a sonography student is present at your site during their 3rd clinical term (April to July), how many patients are booked down per day to accommodate the student?

_____ # of patients per day

d) On average, when a sonography student is present at your site during their 4th & final clinical term (July to September), how many patients are booked down per day to accommodate the student?

_____ # of patients per day

6. For answering the following questions, if you don't have exact numbers, please provide your best guess.

How many patients does a student scan independently in a given day?

a) During a student's 1st term (May to July)...

_____ patients are seen independently by the student per day

b) During a student's 2nd term (January to March)...

_____ patients are seen independently by the student per day

c) During a student's 3rd term (April to July)...

_____ patients are seen independently by the student per day

d) During a student's 4th & final term (July to September)...

_____ patients are seen independently by the student per day

7) Choose the one that you agree most with. "I think that working with a student..."

- a) Helps our hospital/clinic scan more patients.
- b) Is our way of giving back to the sonography community.
- c) Is an important method for recruiting new staff.
- d) Is something that we do only because we are required to.

8) Working with a student makes my job:

- a) Easier
- b) Does not make a difference
- c) Harder

9) Do you enjoy working with a student?

- a) Yes
- b) I'm indifferent
- c) No

10) Do you feel sufficiently compensated for your work with a student?

- a) Yes
- b) I'm indifferent
- c) No

11. In terms of the cost vs benefit evaluation of providing clinical placements for sonography students at your site...

a) When students are present at my site, these are some of the other costs that we have experienced. *(Please be specific. Describe events, experiences or situations that have arisen directly due to the presence of a student, or the occurrence of a clinical term.)*

b) When students are present at my site these are some of the benefits that we have experienced. *(Please be specific. Describe events, experiences or situations that have arisen directly due to the presence of a student, or the occurrence of a clinical term.)*

12. Is there anything else that you would like to share with us, about your experience with sonography clinical placements? All other comments and feedback are welcome. We hope to use this data to improve the clinical experience for sonography sites in the future.

Appendix C. Invitation Email

FINANCIAL IMPACT OF SONOGRAPHY PRACTICUMS ON HOSPITALS AND CLINICS IN BRITISH COLUMBIA

You are invited to participate in a research study. This study has received ethics and operational approval for all Health Authorities in British Columbia.

This study is collecting more information about the financial impact that student sonography practicums may have on hospitals and clinics in British Columbia. It is being conducted by Tatym Schneider, MEd candidate, as a research project under the supervision of Dr. Michelle Pidgeon as the Primary Investigator, Faculty of Education, Simon Fraser University.

Participation in this study is voluntary. If you agree to participate in this study, you will be asked to complete an online survey about student practicums (estimated completion time 10 to 20 minutes). No personal or personally identifiable information will be collected or used for the purposes of this study.

There are two criteria necessary to participate in this study: (1) Be in the role of either a sonography supervisor or manager, sonography Clinical Instructor/Liaison, or sonography technologist. And (2) be currently employed at a hospital or imaging clinic that hosts sonography practicums/students.

The survey will be available from May 11 to June 8, 2022. After that time the survey is closed and can no longer be participated in.

Feel free to share this email with anyone that you feel also meets the above criteria and would be interested in participating in this study.

The link to the survey is below: <https://www.surveymonkey.ca/r/SonoPracticumsSFU>

If you have questions about this study please direct them to the research team:
Tatym Schneider or Michelle Pidgeon

Thank you,

Dana Armstrong
Admin Assistant
School of Health Sciences
College of New Caledonia

Appendix D. Solicited Sites

A total of 18 sites were contacted from the following areas:

- Fraser Health
- Island Health
- Interior Health
- Northern Health
- Aberdeen Ultrasound & Xray, Kelowna
- Brooke Radiology, Burnaby
- Greig Associates, Vancouver
- Medray Imaging Clinic, Coquitlam
- West Coast Medical Imaging, Vancouver

Appendix E. Invitation Letter and Consent Form

FINANCIAL IMPACT OF SONOGRAPHY PRACTICUMS ON HOSPITALS AND CLINICS IN BRITISH COLUMBIA

You have received this letter as an open invitation to participate in a research study.

Title of Study: Financial Impact of Sonography Practicums on Hospitals and Clinics in British Columbia

Department: Department of Education

Student Investigator: Tatym Schneider

Course Instructor: Dr. Michelle Pidgeon, Faculty of Education, SFU

INVITATION AND STUDY PURPOSE

The aim of this study is to conduct a cost-benefit analysis of the impact of sonography Practicums on hospitals and clinical sites. This study is being conducted by Tatym Schneider, MEd candidate, as a research project under the supervision of Dr. Michelle Pidgeon, Faculty of Education, Simon Fraser University, as a partial requirement for her Masters in Educational Leadership. You are being invited to take part in this research study because of your involvement with student sonography practicums in British Columbia.

To participate in this study, you must meet the following requirements: (1) Be in the role of either a sonography supervisor or manager; sonography clinical instructor/liaison, or sonography technologist. And (2) currently be employed at a hospital or imaging clinic that hosts sonography practicums/students. If either or both of these criteria do not apply to you, or if you think this invitation was sent to you in error, please ignore it.

VOLUNTARY PARTICIPATION

Your participation is voluntary. You have the right to refuse to participate in this study. If you decide to participate, you may still choose to withdraw from the study without any negative consequences. To withdraw, please exit the survey screen at any point before you submit your responses. Due to the confidential nature of this survey, we will not be able to remove your answers once they have been submitted.

WHAT HAPPENS TO YOU IN THE STUDY?

Survey: If you participate in this study, you will be asked to complete an online survey about your experience with student sonography practicums. The survey will be delivered and conducted using Simon Fraser University's SurveyMonkey tool. It will contain 12 questions, which is estimated to take between 10 to 20 minutes to complete. The survey will only take one session to complete.

Your data: Your answers will not require any personally identifiable information and we will not collect any such data beyond the default operation of the Survey Monkey tool. The data files will be stored using the secure SFU Vault server.

Publication: The survey data will be used to conduct a cost benefit analysis to study the impact of sonography practicums on clinical sites within British Columbia. Your answers, and any data derived thereof that does not personally identify you, may be included in the final paper and be published.

Aftermath: At the conclusion of the study, following current best practices in research to preserve the data for future use in open access initiatives, the data will be stored in the secure Simon Fraser University Vault server for a maximum of five years. The data will be stripped of any personally identifiable information that could be used to identify participants.

POTENTIAL RISKS OF THE STUDY

The survey has been designed to minimize and eliminate any personal information that could possibly be deemed to harm or be bad for the participants. Some of the questions asked may upset participants, as they require reflection of personal experiences at work and with students during sonography practicums. An example of one of these questions include "Do you enjoy working with a student?". If you have any concerns about reflecting on your experience with student practicums, you are welcome to leave that survey question blank.

POTENTIAL BENEFITS OF THE STUDY

Participating in this study may not benefit individual participants directly, but it will help in the acquisition of data about the challenges associated with sonography practicums. This study may be helpful toward improving future policy and legislation that protects practicum sites and practicum site staff, as well as to provide better education experience for students.

CONFIDENTIALITY

Your confidentiality is a primary concern and will always be respected. Personal information such as your name or title will not be collected. This survey is hosted by Simon Fraser University's survey tool, Survey Monkey. Survey Monkey is a US company with headquarters in San Mateo, California, and as such, is subject to the USA Patriot

Act and CLOUD Act. These laws allow government authorities to access the records of host services and internet service providers. By choosing to participate, you understand that your participation in this study may become known to US federal agencies. While using the survey tool, it is technically possible to link your answers to the IP address of the computer or smartphone you used to complete the survey. However no such analysis will be made as part of this study, and your computer or smartphone IP address from the time of your completion of the survey will not be included in the stored data. Any personally identifiable information will not be included in the stored data. Please note that sharing the survey link, liking, sharing or commenting on the study on social media or other forums about this study may identify you as a participant. We therefore suggest that if this study was made available to you, you refrain from sharing the link unintentionally. If the study is published, any and all data will only be presented in the aggregate, which ensures that it is not possible to identify participants or the hospitals/clinics they are affiliated with.

STUDY RESULTS

The results from this study will be used to complete the Masters in Educational Leadership requirements for Tatym Schneider. The final stored data (without any personally identifiable information) may be used in further studies. The final paper will be submitted to the SFU library repository, and will be publicly available.

CONTACT FOR COMPLAINTS OR CONCERNS

If you have any concerns about your rights as a research participant and/or your experiences while participating in this study, you may contact the SFU Office of Research Ethics or Dr. Michelle Pidgeon, Faculty of Education, SFU

FUTURE CONTACT

No future contact or followup studies are currently planned, and we do not anticipate following up. Future studies are unlikely to follow up with participants directly as a consequence of this study or their answers, since the stored data cannot be used to personally identify any participant or their participation in the study. Participant names or contact information will not be stored.

PARTICIPANT CONSENT

Taking part in this study is entirely up to the choice of the participant. Participants have the right to refuse to take part in this study. Participants may choose to withdraw from the study at any time without giving a reason and without any negative consequences.

- Continuing with the online survey indicates that you have received a copy of this consent form for your own records.
- **Continuing with the online survey indicates that you consent to participate in this study.**

- You do not waive any of your legal rights by participating in this survey.

Participants are free to share this email with anyone else that they feel also meets the above criteria, and would be interested in participating in this study.

Click Here to Continue To The Study

<https://www.surveymonkey.ca/r/SonoPracticumsSFU>

Tatym Schneider
MEd Candidate
Simon Fraser University