Design, Development and Implementation of a Distance Education Training Package for an Obstetrical Telehealth Project within the McGill University Health Network

Chantal Bastien

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By: Chantal Bastien

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complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

Signed by the final examining committee:

Professor Claude Martel Chair

Professor Richard Schmid Examiner

Professor Bob Bernard Examiner

Professor Vivek Venkatesh Supervisor

Approved by _____
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_____
Dean of Faculty

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Abstract

Telehealth innovatively incorporates technology into healthcare to improve access of patients to clinical professionals. This research presents the planning and implementation of an obstetric telehealth project. Fetal monitoring is an integral part of maternal follow-up in high risk pregnancies. Sharing of an obstetric information technology platform between a tertiary care urban hospital and regional partner health establishments allows electronic capture of fetal non stress tests and their asynchronous interpretation and reporting to distantly monitor maternal and fetal health. With the launch of this program future mothers will be able to remain in their home communities while receiving optimal prenatal care. Change management strategies are introduced as an integral component of the telehealth team approach to the development of new services. The focus of the paper is the development and delivery of the instructional package to the clinicians adding this service to their practice. The purpose of this thesis equivalence study is to examine the dual roles of telehealth clinical coordinator and instructional designer of the candidate.

This thesis equivalence presents the development and implementation of a training program in the context of a healthcare informatics project. The paper initially introduces the outline of the thesis objectives in relation to the telehealth program under study. It continues on to define the project itself, and the expected clinical and change management impacts on clinical and administrative collaborators. It moves on to explain the set-up of the project team and its organization in terms of technological, clinical, and educational partitioning of the mandates. Next, the medical informatics solution is depicted along with the learning needs of the specific users. The strategy selected for the design, development and implementation of the training solution concludes the first part of the thesis equivalence.

The second portion of the paper describes the research objectives and the chosen design for the study of the project. The timeline follows to inform on the chronology of the preparation and deployment phases. The listing of the results closes this segment of the thesis equivalence with the actions taken and deliverables produced by the telehealth team and the regional partners.

The latter section of the work offers a discussion of the project organization, preparation, and deployment. An analysis of these phases explores the lessons learned through several lenses. Project management, change management, educational technology, and organization aspects are viewed through theoretical, practical and research perspectives. The paper finishes with recommendations for future related research and general conclusions on the project.

Design of the Educational Technology Thesis Equivalence

General Outline

The telehealth project studied aims to introduce a new healthcare activity by combining information technology (IT) and clinical software to provide distance health services to specific isolated regional populations (Télésanté RUIS McGill, 2011, *20110922_PropositionNST [internal work document]*). This thesis equivalence will present the steps involved in the development and realization of this innovative health service. The outcome of the thesis equivalence will be the production of a training program answering the clinical and technological learning needs of local personnel. A description of change management strategies elaborated to facilitate the transition to the telehealth service is offered as an accompaniment to the guide.

Thesis Equivalence Objectives

While the telehealth goal is to improve the obstetric care of patients in these remote communities by providing access to the clinical application, the main objectives of this thesis equivalence are:

- Creation of a training manual
- Instruction of the resulting program by distance education technology to all clinical and administrative partners involved
- Evaluation of the teaching by the learners
- Implementation of change management strategies

Clinical Learning Objectives

Several technologies and software are involved in this project. Obstetricians, nurses, community health representatives, and administrative agents will be learning to work with new telehealth tools and equipment. This proposal focuses on the learning and training needs of each category of clinical and administrative participant.

The identified learning objectives of the personnel of the requesting establishments are listed below:

- How to work with an electronic fetal monitor
- How to work with the obstetric clinical application to electronically upload and transmit NST tracings

The identified learning objectives of the personnel from the providing hospitals are:

- How to work with the obstetric clinical application to electronically access NST tracings, interpret the tracings, and submit a report

Project Clinical Coordination

Many persons in various roles have participated in the project. This paper will focus mostly on the role of the clinical coordinator (Payette, Desrochers, Lavoie-Tremblay, and Richer, 2010).

Clinical coordination responsibilities related to the project are to:

- implement clinical telehealth services by optimizing workflows

- provide training on clinical tools
- offer ongoing support for learning and organizational needs
- manage change processes

The elements of this new service are identified through several strategies, such as:

- Ongoing discussion and feedback with coworkers in the telehealth department
- Conducting a learning needs assessment
- Designing and developing the required educational materials
- Delivering the instructional program by distance education technology
- Evaluating the quality and usefulness of the instructional program and of its method of delivery
- Establishing change management initiatives

Thesis Equivalence Plan

This thesis equivalence aims to:

- Describe the nature of the clinical request leading to the telehealth project development
- Document the current care strategy for these patients
- Present the envisioned new clinical model of care
- List the pertinent learning and performance issues involved in the adoption of clinical technology in this context

- Identify and manage the technological, information technology, clinical, and educational change process
- Outline the steps of the feasibility test
- Conduct the clinical and educational portion of the feasibility test
- Obtain a formative evaluation of the draft of the training program
- Design and develop a training manual on the selected technological equipment and clinical software for the clinicians and administrative agents located in the requesting establishments and the providing hospitals
- Identify optimal instructional strategies for the design and development of learning materials for distance education in the healthcare environment
- Determine the best distance education teaching strategy in the project context
- Deliver the training program to the clinicians and administrative agents by distance education
- Obtain a summative evaluation of the training program
- Collect the opinions of the project's clinicians on the efficacy of the training manual and the distance education strategy
- Provide just-in-time support during the launch period of the project
- Adjust training materials according to issues identified during the start-up period
- Adjust change management strategies according to issues identified during the start-up period

Instructional Design Deliverables

The principal learning deliverable produced is an instructional program on the telehealth tools essential to the success of the project. The training manual is based on:

- The learning and performance objectives of the telehealth project
- The clinical role of the learners
- The learning and performance needs assessment
- The learning and performance lessons learned during the feasibility test
- The formative evaluation obtained on the initial form of the training program for the feasibility test
- The distance education solutions adapted for clinical education

The remaining deliverables consist of training support media for the learners, internal procedural literature for the telehealth team, and organizational and communication documents for the regional partners. These documentation materials are developed to facilitate the change management process.

Description of the Telehealth Project

Scope

The initial project is the implementation of a new telehealth service between the nine Terres-Cries-de-la-Baie-James region villages and the Val-d'Or hospital in Abitibi-Témiscamingue. As the project's objectives could answer the needs of other isolated communities, the scope was extended to include a total of 18 sites in the

Abitibi-Témiscamingue, Nord-du-Québec, and Terres-Cries-de-la-Baie-James regions.

The subsequent narration describes the original plan and scope in order to grasp the inceptive intent of the project. It concludes by presenting the final list of sites participating in the development of this new healthcare service.

Original project. The province of Québec is home to several aboriginal communities. The population of the Cree region of James Bay represents the third largest aboriginal nation of Québec (Secrétariat aux affaires autochtones, 2013, July 23, Statistiques des populations autochtones 2012). The inhabitants reside in 9 villages located on the James Bay coast, on the Hudson Bay coast, and inland, on a territory covering almost 20% of the surface of Québec.

The distances between the individual villages, the isolation caused by the even greater distances from major urban centres, along with the difficult climate form constraints in access to many basic services.

Providing healthcare services in this context requires precise organization and coordination within the region as well as with neighbouring regions and the Montreal area. The Cree Board of Health and Social Services of James Bay (CBHSSJB) organizes the delivery of healthcare activities to the residents of the region (Cree Health, n.d., home page). Access to specialized care can involve the transfer of patients to Chibougamau, Val d’Or, or Montréal.

Final project. As other communities in the Nord-du-Québec and Abitibi-Témiscamingue regions function within similar contexts of isolation and dependency on distantly-located partners for specialized healthcare as the Terres-Cries-de-la-Baie-James region, nine extra sites were added to the project. The scope was enlarged from a service to improve obstetric care of the aboriginal Cree population to serve the entire clientele of the three regions.

Need for Innovation

Basic organization of the project sites. Table 1 introduces the 18 sites and their respective region. Figure 1 represents the geographical distribution of the project sites (Google Maps, n.d.).

All healthcare establishments have developed local services and programs promoting prevention and care of health issues. They have also entered into professional relationships with other centres in order to provide optimal health services to the population, irrespective of their area of residence. Intra- and extra-regional health service corridors are governed by agreements between the specific establishments and determined by specialty and level of care (Atlas intranet ministériel de la Santé et des Services sociaux du Québec, n.d., Corridors de services médicaux intra et extrarégionaux). Levels of care in Québec have been divided as follows:

- First line: general and current services, such as a Centre local de services communautaires (CLSC), a medical clinic, a pharmacy, Info-Santé, and professional services cabinets

Table 1
Project sites by health establishment and region

Site	Health establishment	Region
Amos	Hôtel-Dieu d'Amos	Abitibi-Témiscamingue
Chibougamau	Centre de santé de Chibougamau	Nord-du-Québec
Chisasibi	Centre hospitalier régional de Chisasibi	Terres-Cries-de-la-Baie-James
Eastmain	Dispensaire d'Eastmain	Terres-Cries-de-la-Baie-James
Lebel-sur-Quévillon	Centre de santé Lebel	Nord-du-Québec
Matagami	Centre de santé Isle-Dieu	Nord-du-Québec
Mistissini	Dispensaire de Mistissini	Terres-Cries-de-la-Baie-James
Montréal	Centre Universitaire de santé McGill	Montréal
Némaska	Dispensaire de Némaska	Terres-Cries-de-la-Baie-James
Oujé-Bougoumou	Dispensaire d'Oujé-Bougoumou	Terres-Cries-de-la-Baie-James
Rouyn-Noranda	Hôpital de Rouyn-Noranda	Abitibi-Témiscamingue
Val d'Or	Hôpital de Val-d'Or	Abitibi-Témiscamingue
Ville-Marie	Pavillon Sainte-Famille	Abitibi-Témiscamingue
Waswanipi	Dispensaire de Waswanipi	Terres-Cries-de-la-Baie-James
Wemindji	Dispensaire de Wemindji	Terres-Cries-de-la-Baie-James
Whapmagoostui	Dispensaire de Whapmagoostui	Terres-Cries-de-la-Baie-James
Whaskaganish	Dispensaire de Waskaganish	Terres-Cries-de-la-Baie-James
Winneway	Centre de santé de Winneway	Abitibi-Témiscamingue

- Second line: specialized services, such as hospitals, readaptation centres, group homes, and youth centres

Figure 1. Geographic distribution of the project sites. Adapted from Google Maps, n.d.

- Third line : ultraspecialized services, such as university hospitals, readaptation centres, and youth centres (Portail du réseau de la santé et des services sociaux de la région de la Capitale-Nationale, n.d.)

Telehealth projects are based on this same organizational concept. There is a first-line requesting site and a second- or third-line providing site. The requesting site is in need of a healthcare service that cannot be provided locally. The providing site is remotely-situated and has the capacity to provide a telehealth service. The 18 sites

involved in the undertaking being studied are each in an existing specific requestor-provider partnership.

Figure 2 presents the sites, the regions, and their service corridors (Télésanté RUIS McGill, 2015, *20150108_CvSSS TRF [internal work document]*). Figures 3-7 represent the distances between the establishments and their respective regional centres (Google Maps, n.d.). It is of interest to note that commuting is influenced by road conditions. At times it can also be impossible to travel from one point to the other until weather conditions return to acceptable circumstances.

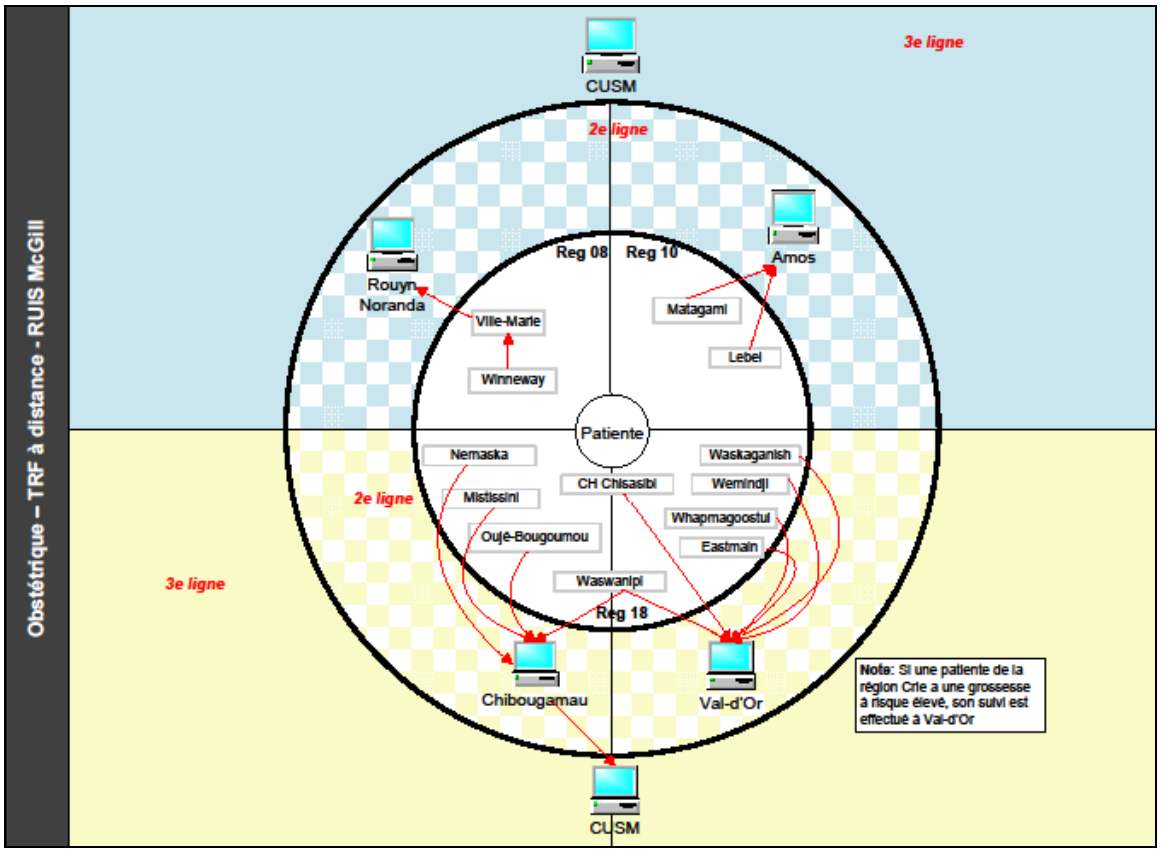

Figure 2. NST project sites by their respective service corridor and by clinical line of care. Adapted from Télésanté RUIS McGill, 2015, *20150108_CvSSS TRF*.

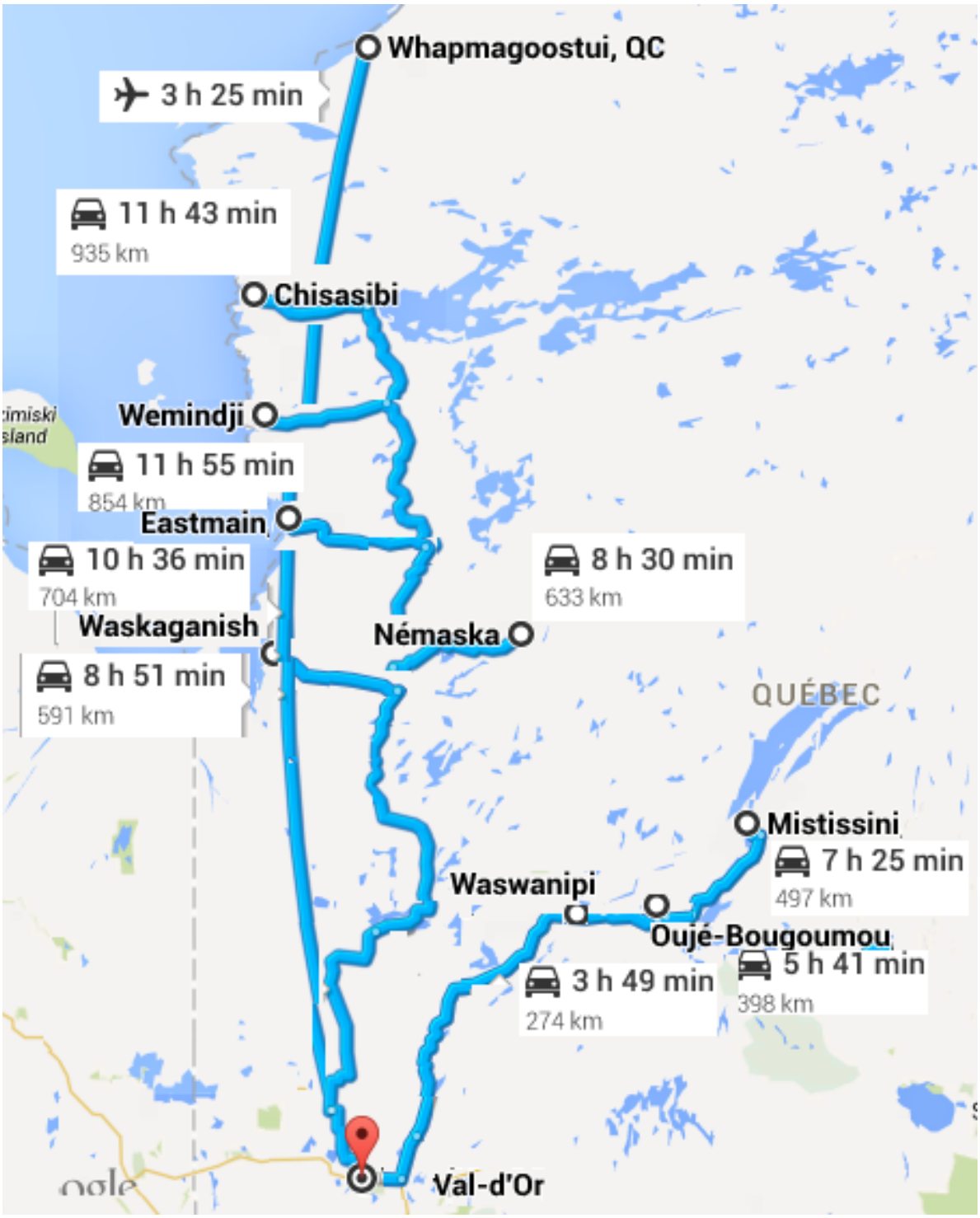

Figure 3. Distances and travel times between requesting and providing sites within the Terres-Cries-de-la-Baie-James – Val-d'Or corridor. Adapted from Google Maps, n.d.

Figure 4. Distances and travel times between requesting and providing sites within the Terres-Cries-de-la-Baie-James – Chibougamau corridor. Adapted from Google Maps, n.d.

Figure 5. Distances and travel times between requesting and providing sites within the Matagami/Lebel-sur-Quévillon – Amos corridor. Adapted from Google Maps, n.d.

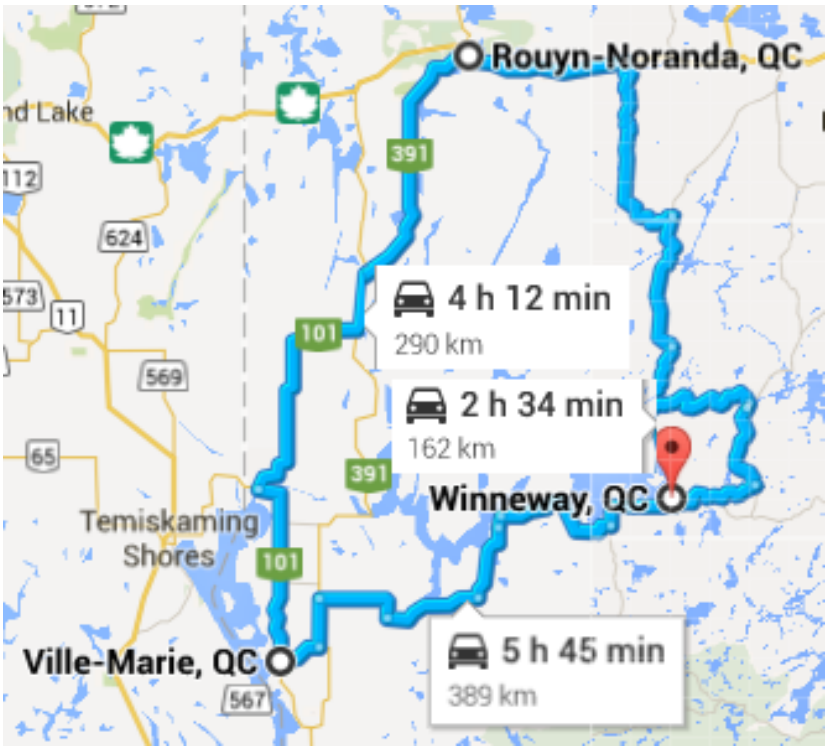

Figure 6. Distances and travel times between requesting and providing sites within the Winneway – Ville-Marie – Rouyn-Noranda corridor. Adapted from Google Maps, n.d.

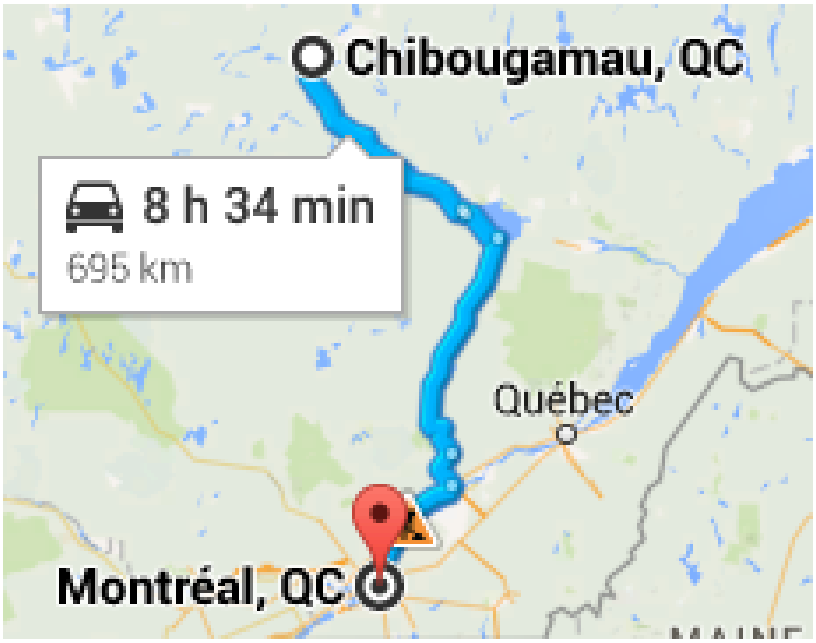

Figure 7. Distances and travel times between requesting and providing sites within the Chibougamau – Montréal corridor. Adapted from Google Maps, n.d.

Current clinical state. A description of the context of each obstetric service corridor presents the respective current clinical situations for pregnancy care and of labour and delivery facilities.

Terres-Cries-de-la-Baie-James – Val d'Or corridor and Terres-Cries-de-la-Baie-James – Chibougamau corridor. The Terres-Cries-de-la-Baie-James region offers its inhabitants access to healthcare establishments in each of its communities. First-line services are offered in 8 of the villages in the form of dispensaries. The Chisasibi hospital offers regional healthcare coverage. Nurses and family physicians are distributed throughout these facilities. For more complex health situations, patients are either seen locally by visiting specialists who travel intermittently to the region, or are transferred to larger hospitals situated in the Abitibi-Témiscamingue and in the Nord-du-Québec regions. For specialized care, patients are sent to the university-based hospitals in Montreal.

In obstetrics, the regional portrait of pregnancy has required the development of a stricter follow-up program for future mothers. The inter-regional organization of obstetric care will be described more specifically, as its context is pertinent to this study.

The birth rate in the region is higher than the provincial average. Moreover, the Cree community has a 75% high-risk pregnancy rate, caused by the prevalence of gestational diabetes, obesity, and multiparity. These conditions require more narrow and frequent maternal follow-ups in the form of antenatal visits, ultrasounds, and fetal monitoring non stress tests (NST). Patients receive their prenatal follow-up at

their village nursing station. As no labour and delivery facilities exist in the region, patients travel to the closest obstetric facility, either Val d'Or or Chibougamau, for the delivery of their baby.

The Centre de santé de Chibougamau offers standard obstetric pregnancy follow-up and labour and delivery care to 3 villages, Oujé-Bougoumou, Mistissini, and Némaska, as well as to Waswanipi (Waswanipi patients transfer either to Chibougamau or to Val-d'Or). Travelling times to Chibougamau vary from 45 minutes by plane from Nemaska, to 1-2 hours by car from Oujé-Bougoumou, Mistissini and Waswanipi.

The Val d'Or hospital provides regular obstetric care to the population of 6 of the Cree villages: Chisasibi, Eastmain, Waskaganish, Whapmagoostui, and Waswanipi and Wemindji, and high risk pregnancy care to all Cree communities. Future mothers delivering in Val d'Or are relocated there as of the 37th week of pregnancy, in order to be physically near adequate delivery facilities. When the pregnancy is high risk, the relocation starts at the 32nd week and the patient remains in Val d'Or until post-delivery, thus causing a prolonged separation from her family. The 900 km distance between the Cree villages and Val d'Or represents a 9 ½ hour flight, when weather conditions are ideal. Since commuting back and forth between home and the clinic for their weekly or twice-weekly follow-up appointments is not possible, these high-risk mothers must remain in Val d'Or, separated from their family and community for over 2 months (personal communication M. Turbide, fall 2011).

Lebel-sur-Quévillon/Matagami – Amos corridor. Lebel-sur-Quévillon and Matagami are municipalities located in the Western section of the Nord-du-Québec region. Patients receive general healthcare services, including routine pregnancy supervision at their local Centre de santé, and are referred to larger establishments for specialized care.

Situated approximately at a 2-2 ½ hour driving distance from Lebel-sur-Quévillon and Matagami, the Hôtel-Dieu d'Amos hospital offers pregnancy follow-up care and labour and delivery services for future mothers of both communities.

Winneway – Ville-Marie – Rouyn-Noranda corridor. Winneway is a native community situated in Abitibi-Témiscamingue. It offers its inhabitants first-level healthcare services.

Obstetric care as well as delivery facilities are situated at a 1 ½ hour distance by car. The Pavillon Sainte-Famille in Ville-Marie provides these services to its regional population. On occasion, there is no medical coverage to allow labour and delivery services. During these periods, the Hôpital de Rouyn-Noranda attends to the needs of the obstetric clientèle. Patients must travel 1 ½ hours to this destination.

Chibougamau – McGill University Health Centre (MUHC). The Centre de santé de Chibougamau's obstetric department offers routine and high risk care, along with second-level delivery facilities to its population and to the Cree communities in its proximity. As such, it regularly performs cesarean deliveries when clinically-required. In higher complexity labours, it occasionally consults third-line centres, such as the Obstetric department of the MUHC, to assist in clinical decision-making.

Main clinical objective. The main objective for patients with normal or high-risk pregnancies is **to ensure optimal obstetric follow-up, in order to avoid maternal and/or fetal complications that could lead to hospitalization and/or the need for premature delivery.** Prevention of complications is possible through close screening of future mothers. The interpretation of fetal monitoring tracings, specifically of NSTs, is a method of choice to detect the state of well-being of the fetus (Society of Obstetricians and Gynaecologists of Canada (SOGC), 2007). NSTs are electronic recordings of fetal heart rate and of uterine activity. They have precise criteria to evaluate the well-being of the fetus, and thus can guide clinical decision-making to ensure optimal health of both fetus and mother (SOGC, 2007).

This project aims to implement telehealth services that will introduce remote monitoring of fetal well-being (Télésanté RUIS McGill, 2012, *20120807_CvSSS_Demande de chang_Teleobs_V04 [internal work document]*). The steps to gain access to a clinical electronic software that allows the electronic upload and transmission of non-stress tests from a fetal monitor, their interpretation in differed time by a remotely-located obstetrician, and the creation of a medical

report accessible by both the requesting health team and the providing obstetric team will be examined in this article.

Planned clinical state. Telehealth provides new and novel opportunities for healthcare professionals to offer their services with the aid of clinical applications and technological support to patients distally located from the healthcare provider. In the McGill Réseau Universitaire Intégré de la Santé (RUIS) Telehealth department, real-time and differed time health services have been developed in partnership with the regional collaborators within our territory. Workflows have been developed to ensure the same high quality in telehealth consultations as in face-to-face consultations. Specific learning modules have been created to ensure adequate use of telehealth online tools and electronic medical equipment.

This thesis equivalence presents one of the telehealth projects currently being implemented in our department. Women's Health is one of the 4 domains the Ministère de la Santé et des Services Sociaux (MSSS) du Québec has mandated be developed by our RUIS (Télésanté RUIS McGill, 2006, *20061214_Manuel d'Organisation de Projet (MOP) Phase 1 du projet : Centre de Santé et des Services Sociaux virtuel (CSSSv) [internal work document]*). This project enhances interregional autonomy between the Abitibi-Témiscamingue, Nord-du-Québec and the Terres-Cries-de-la-Baie-James regions, and strengthens the link to a university tertiary-level obstetric centre situated in the Montreal area.

As in traditional medical consultations, the goals in telehealth are to ensure optimal maternal-fetal health and thus avoid hospitalization of mothers. If the mother's or

fetus' health status deteriorates and necessitates more acute take-over, the usual existing mechanisms of the patient's transfer to her regional obstetric centre or to Montreal will be set in motion.

One aspect of follow-up and prevention of complications involves electronic fetal monitoring via NST interpretation. Telehealth aims to make available to these regions an obstetric clinical application in use at the McGill University Health Center and to provide technological support for the transmission of fetal electronic monitoring tracings for patients with high risk pregnancies living in the 18 regional sites. The estimated number of NSTs for the Cree region is 80 – 120 tests per month. Patients will have weekly or biweekly NSTs done at their local community CLSC. Providing normal NST results, patients would remain in their home environment until 36 or 37 weeks of gestation and then be transferred to Val-d'Or to await their delivery. The other sites will utilize the service sporadically when required by emerging obstetric complications in order for the providing physicians to determine if the patient is in need of transfer to the regional establishment.

The goal of our telehealth project is to set up the realization of NSTs in all requesting sites, with the reading and interpretation of the NSTs performed within 24 hours by an obstetrician of the providing Obstetric department. This would allow for the evaluation of fetal well-being, the detection of premature labor, and the determination of a personalized treatment plan. The clinical software allows remote access to the NST strips for interpretation by both the obstetricians at the regional providing hospitals for standard care, and by the obstetricians at the MUHC for more advanced care, if necessitated by the maternal-foetal condition.

The thesis equivalence study will provide a record of the various steps of the project from conception to implementation. It can serve as a basis for future similar projects, indicating successful strategies and options to avoid.

As our telehealth project could answer the obstetrical needs of other isolated communities, several intraregional and interregional partners became interested in joining the initiative. Initially, the service was first to be established in the Chisasibi – Val d'Or corridor, and then be expanded to the other Cree communities. Similarly isolated localities in the Abitibi-Témiscamingue and Nord-du-Québec regions are to be deployed later, as they complete their technological preparation.

Anticipated clinical benefits. Relocating patients for several weeks causes a variety of impacts. The separations caused by the transfer to Val d'Or and other centres have an important negative human impact on the future mother and her family. Costs to the healthcare system are also high. As an example, airfare rates between Chisasibi and Val-d'Or are $2000/person. Patients receive daily allowances of $25 for meals and $30 for lodging. As this daily allowance is often insufficient, patients must spend from the family budget to cover the extra costs encountered. As the patient is allowed to be accompanied by one person during her relocation, these sums are frequently doubled.

Through the implementation of the proposed remote fetal monitoring technology:

- the patient will be able to remain at home longer, travelling to the regional centre only in the last weeks of the pregnancy to deliver there

- the evolution of pregnancy, the well-being of the fetus, and the signs of premature labor will be monitored at a distance, in order to determine the optimal follow-up and treatment plan for the patient
- the existing mechanisms of transfer to the respective regional establishment or Montreal will be rapidly activated, in the event of a change in the maternal-foetal condition necessitating a more intensive treatment plan

Expected Impacts

Thus, this telehealth project will:

- Shorten the relocation period of patients to their regional providing establishment
- Facilitate access to follow-ups for high-risk pregnancy patients while remaining in their community of origin
- Provide adequate and pertinent treatment plans
- Diminish the costs of the obstetric service

Change Management Goals

General Concepts

The central element of the project is the adoption into regular clinical practice of the obstetric software. While the degree of integration of healthcare information technology varies widely between health establishments, medical informatics is definitely a new and growing work tool in healthcare (Kaye et al., 2010). The single factor guaranteeing its successful implementation is collaboration of clinicians.

Benefits to clinicians need to be clearly and visibly presented to promote uptake of this innovation.

Staff must be adequately informed and supported during the transition period (Whelan-Berry and Somerville, 2010). Training should provide the required skills to use new programs and software, as well as inform on the added value of incorporating clinical informatics into daily activities (Carter et al., 2010).

The change management strategies entertained in this study are participatory and inclusive, where creativity is encouraged at all levels of the organization (Graetz and Smith, 2010). The reality of change is that it is multi-level in nature. Systems theory acknowledges change's impact across all units, internal sub-systems and external environments. It implies a balance between differentiation of each of its sub-parts, and integration of individual functions to achieve best performance of the whole.

Specific Impacts of the Project

Adopting telehealth implies:

- Creating and/or changing current workflows
- Identifying new roles
- Identifying technological, administrative, and clinical key players
- Reorganizing responsibilities at the requesting and the providing sites

This project necessitates a change in the organization of care at both the requesting and providing sites. Currently when an impending complication is identified, patients are transferred to a second line establishment for an onsite evaluation. The

implementation of telehealth in the obstetric sector opens the opportunity to evaluate the patient prior to the decision to transfer. This new step in the management of care implies that in the advent of a decision to not transfer, the first-line centres are required to ensure surveillance and treatment usually given by the providing site. This allows local empowerment and strengthens practice (Inforoute Santé du Canada, 2011, May 30). The nurses in the villages will encounter increased autonomy in the management of their obstetric patients, which will mandate new protocols and skills to be mastered. Consequently, their readiness to care for patients will be increased, a valuable situation as high risk pregnancy patients are expected to remain in their villages until the late pre-term period.

The site with responsibility for care and the expected substitution of duties for each service corridor involved in the project are here outlined to appreciate the extent of the required change in practice.

Terres-Cries-de-la-Baie-James – Val d'Or corridor and Terres-Cries-de-la-Baie-James – Chibougamau corridor. In the Terres-Cries-de-la-Baie-James – Val-d'Or corridor, the Val d'Or nurses and obstetricians currently exclusively care for the Cree region patients in the last weeks of pregnancy. A decrease in the number of outpatient visits to the Antenatal Clinic, with an accompanying rise of virtual patient assessments is the major expected change as a large proportion of clinic visits are from Cree patients.

New workflows need to be determined in partnership with the healthcare staff of each of the 9 Cree communities. The responsibility of carrying out several clinical

acts is transferred from the Val-d'Or hospital to the villages. While the Chisasibi hospital nurses routinely perform NSTs, this skill is new to the staff in the remaining communities.

Lebel-sur-Quévillon/Matagami – Amos corridor. The team of the Lebel-sur-Quévillon and Matagami sites routinely complete NST tracings for their clientele. The NST tracings are presently faxed to the Amos Obstetric Department. A phone conversation completes the transmission of clinical information to the providing site. The telehealth project plans to facilitate transmission of the clinical data and improve readability and traceability of the NSTs for easier evaluation by the Amos team. The responsibility of care is predicted to remain similar to current practice. The clinical impact of the onset of the service is evaluated to be minimal in this service corridor.

Winneway – Ville-Marie – Rouyn-Noranda corridor. For the Winneway – Ville-Marie corridor, the NST service innovates in a manner similar to that occurring in the Cree region communities. To incorporate the telehealth service into their obstetric routine, the local nurses will learn to perform NSTs according to the newly-developed protocol between their health centre and the Ville-Marie hospital.

In the Ville-Marie – Rouyn-Noranda partnership, the expected variation in care responsibility is more subtle. Ville-Marie's hospital employs family medicine physicians experienced in obstetrics. The advent of the telehealth service will assist the Rouyn-Noranda team to take charge of pregnant patients when medical coverage is sporadically lacking in Ville-Marie. The benefits of the NST service reside in facilitating transmission of clinical data to the Rouyn-Noranda

obstetricians. The required learning is limited to the use of the clinical obstetric software.

Chibougamau – McGill University Health Centre (MUHC). The Chibougamau hospital team will use the service in two manners. The first is outlined above in the Terres-Cries-de-la-Baie-James – Chibougamau corridor section.

The latter goal of the telehealth service pertains only to this site. This establishment has a higher rate of cesarean section than average and aims to optimize the number of these surgeries. In order to meet this goal, the Chibougamau team will consult the MUHC on-call obstetrician to obtain a tertiary level opinion, to aid in the decision-making process, when faced with difficult labours possibly requiring cesarean section. This practice will transfer expertise and promote local autonomy.

Portrait of Telehealth Organization

Organizational Structure

In 2006, the Ministère de la Santé et des Services sociaux (MSSS) gave the Centre virtuel de santé et de services sociaux (CvSSS) of the RUIS McGill Telehealth department the mandate to develop and deliver healthcare services in four specific domains: cardiology, mental health, oncology and women's health (Télésanté RUIS McGill, 2006, *20061214_Manuel d'Organisation de Projet (MOP) Phase 1 du projet : Centre de Santé et des Services Sociaux virtuel (CSSSv) [internal work document]*). As the McGill RUIS offers specialized health services to a population of 1.8 million persons living in an area covering 63 % of Québec's territory (RUIS McGill – McGill University, n.d.), the opportunity provided by both hardware and

software technology to virtually connect patient and clinician became the cornerstone of the global project.

The network constructed within the McGill RUIS for telehealth services is shown in Figure 8 (Télésanté RUIS McGill, 2015, *Diagramme_reseau_CECoT [internal work document]*). The Centre virtuel de santé et services sociaux (CvSSS) is the virtual entity that rallies the health establishments of the 7 administrative regions comprised in the McGill RUIS. The position of the CvSSS relative to the Québec healthcare and the McGill RUIS frameworks is depicted in Figure 9 (Telehealth RUIS McGill, n.d., Politiques et procédures de télésanté du RUIS McGill page). The Centre d'expertise et de coordination de Télésanté (CECoT) of the CvSSS is the single entry point to all telehealth services. The CECoT assists our clientèle in five key spheres:

- Request management
- Technical support
- User training
- Project management
- Quality and performance management

The CECoT acts as the gateway to access telehealth projects, services, and support. It responds to first-line requests and upscales enquiries to the appropriate members of the team as needed.

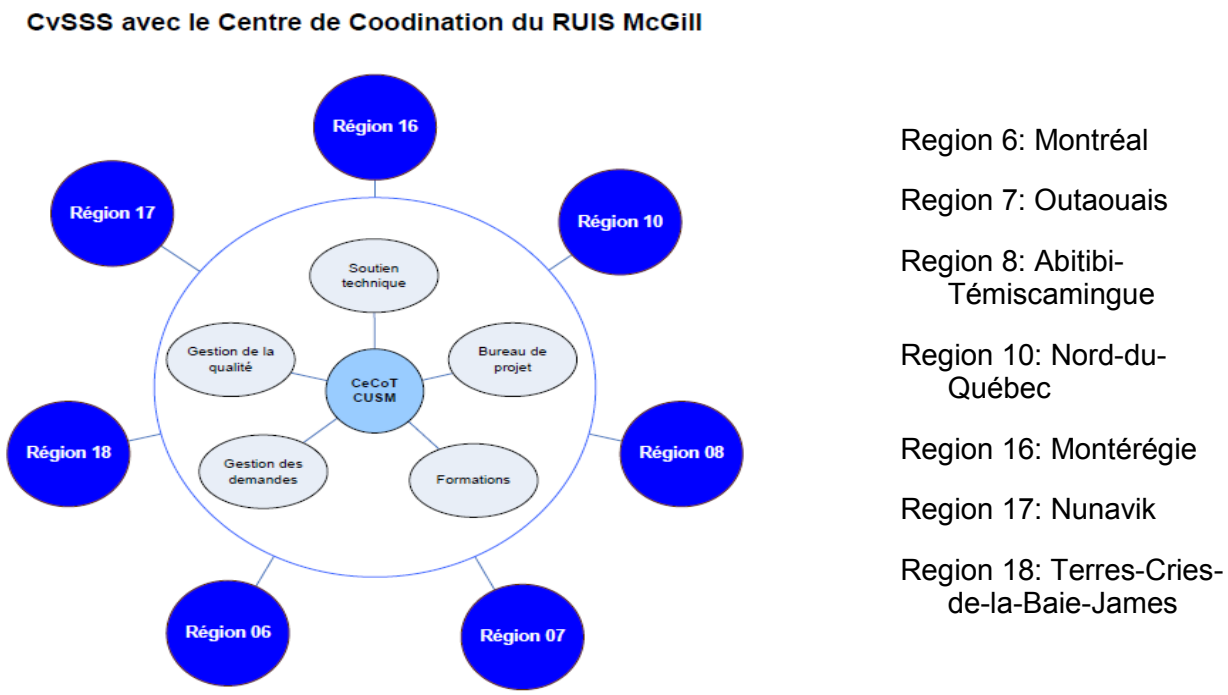

Figure 8. Regional partners of the McGill RUIS telehealth network. Adapted from Télésanté RUIS McGill, 2015, *Diagramme_reseau_CECoT*.

This work will concentrate on the clinical aspects of telehealth services. It is important to mention that telehealth clinical services are deployed through the affordances of selected stakeholders, specific technological equipment and health informatics software. These three entities are interrelated and as a whole allow the creation of a telehealth service. As appropriate, all three aspects will be discussed in this thesis equivalence.

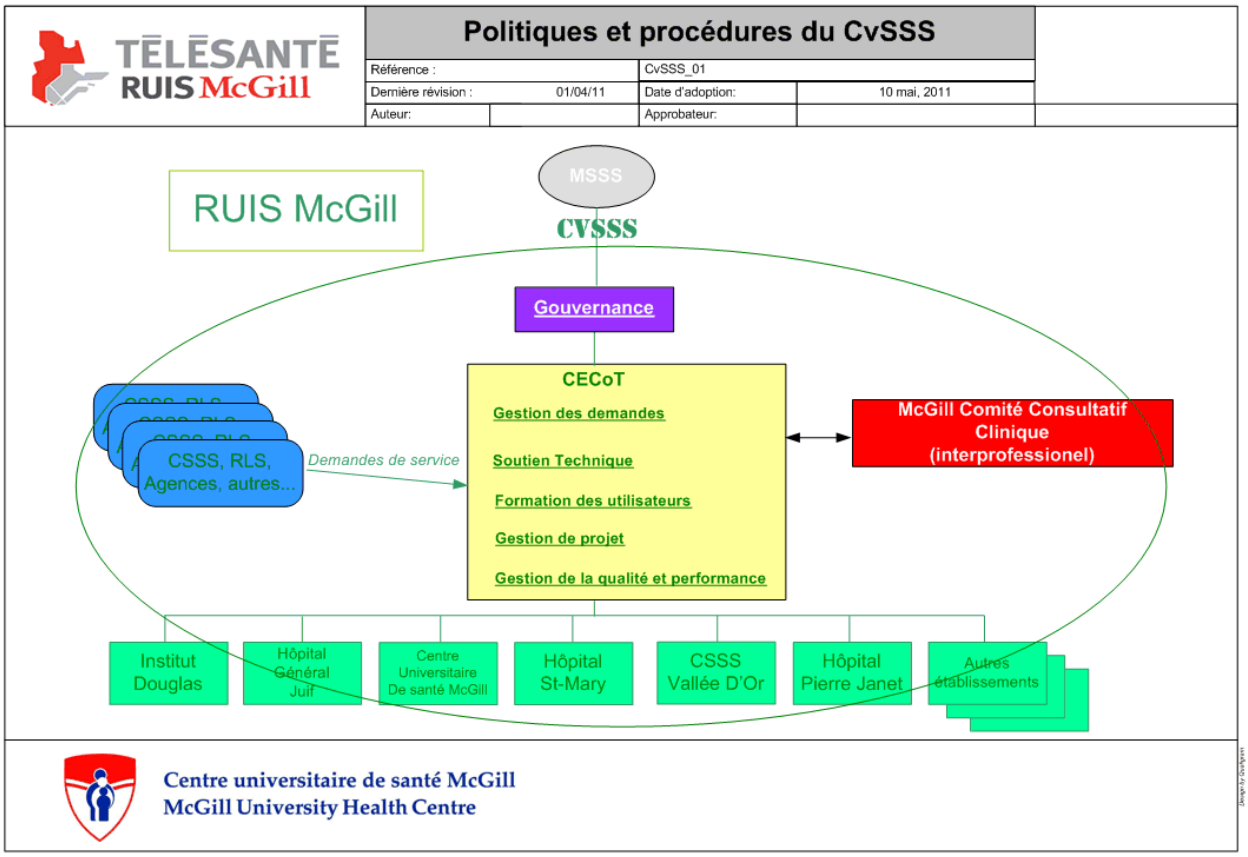

Figure 9. Structure of the CvSSS within the McGill RUIS and the Québec healthcare system. Adapted from Telehealth RUIS McGill, n.d., *Politiques et procédures de télésanté du RUIS McGill page*.

Development of Clinical Services

Since July 2012, the CvSSS offers real-time and differed-time telehealth clinical services to the population of the McGill RUIS. The CECoT works in close partnership with regional and local representatives of the 125 health establishments in its territory to identify clinical needs and establish the corresponding offers of services.

The process shown in Figure 10 outlines the specific steps taken to bring a telehealth project request to its operational deployment (Telehealth RUIS McGill, n.d., Développement de services cliniques page).

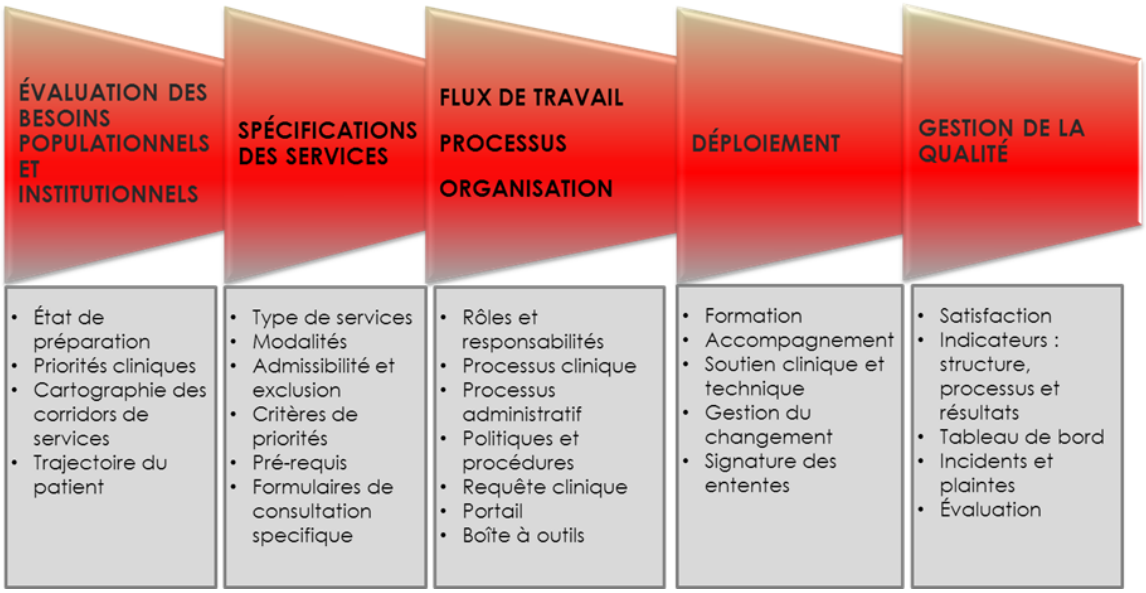

Figure 10. Phases of deployment of a telehealth service within the CvSSS. Adapted from Telehealth RUIS McGill, n.d., *Développement de services cliniques page*.

The telehealth team assists in ensuring the transition from traditional to telehealth consultations by supporting both requesting and providing sites through the organization, coordination, change management, and learning processes, at the technological, administrative, and clinical levels. The internal work flow proceeds from evaluation of the pertinence of a project request, to clinical and technological feasibility appraisals, on to development and implementation of a new clinical workflow, through to identification and training of users, and finally to service deployment, support and evaluation. Telehealth adoption invariably imposes change. As clinician buy-in to this alternative form of healthcare service is essential

to its success, the telehealth team strives to adapt to local existing procedures and practices to lessen the impact of the integration of this new care delivery method.

Clinical Coordinator Role

The telehealth team consists of a group of 22 persons. As in all team efforts, the input of each person is essential to project success (Project Management Institute, 2008). Event coordination, audiovisual support, IT analysis, process analysis, clinical service, project management and quality assurance are all spheres relevant to telemedicine service organization and support. Each person in the department possesses knowledge of at least one of these expertise fields.

This thesis equivalence study focuses specifically on the role of the clinical coordinator. Payette et al. (2010) studied this new role within our department. Three core competencies were identified as central to the role:

- **Knowledge.** Knowledge of the specific clinical domain and its resource network, knowledge of available suitable telecommunication technologies, knowledge of organizational processes, structures and networks, and knowledge of political issues within the regions of the RUIS were considered essential factors.
- **Expertise.** Clinical expertise of the medical field in order to understand the needs of the telehealth program, leadership qualities to lead the project and work with the interprofessional teams, and marketing abilities to engage clinicians in innovative care methods are listed as essential qualities for the

role. In light of the required expertise, a nurse would best be suited for this position.

- **Clinical experience.** Experience in the related specialty resulting in maturity in the field will enhance credibility of the clinical coordinator and promote engagement in the project.

The clinical coordinator has a multifaceted and complex role, fulfilling clinical, educational, and organizational functions (Payette et al., 2010). Related tasks are:

- Triage of clinical requests
- Prioritization of requests and dispatch to the appropriate care provider in opportune time
- Teleconsultation coordination (Telehealth RUIS McGill, n.d., Formation des utilisateurs page)

Most pertinent to this study is the last task. The coordination of a telehealth undertaking demands project and change management skills, educational and training skills, and in-depth understanding of clinical applications, medical peripherals and clinical tools.

Attributes of the Obstetric Clinical Software

Centricity Perinatal

Clinical characteristics. Centricity Perinatal is a comprehensive software suite developed by General Electrics (GE) to facilitate obstetric care (GE Healthcare, n.d., Centricity Perinatal page). It is a clinical information system integrating documentation and fetal surveillance, designed to optimize caregiver access to critical clinical information throughout the entire pregnancy and neonatal period.

The clinical application can improve performance and quality by:

- Increasing efficiency with streamlined data entry and optimization of workflows
- Enhancing patient safety by promoting accuracy of reporting, communication coordination, and instant and remote access to patient records and reports

Technological characteristics. The integration of the GE Centricity Perinatal application into a health establishment IT structure is a complex endeavour. The software must at minimum connect with the local IT system, its specifically-dedicated computers and the electronic fetal monitors to function as a group.

The perinatal system functions in a network mode, actively and constantly communicating with all its components to collect and store data. The program requires multicast technology to maintain its integrity.

Most internet communication is unicast in nature, where a transmission is sent to a single destination identified by a unique internet protocol (IP) address (Wikipedia,

n.d., Unicast page). Multicast is group communication within a computer network, in which information is simultaneously addressed to a group of interested computers, identified by known IP addresses, in a single transmission (Wikipedia, n.d., Multicast page). Figure 11 represents the two described communication modes.

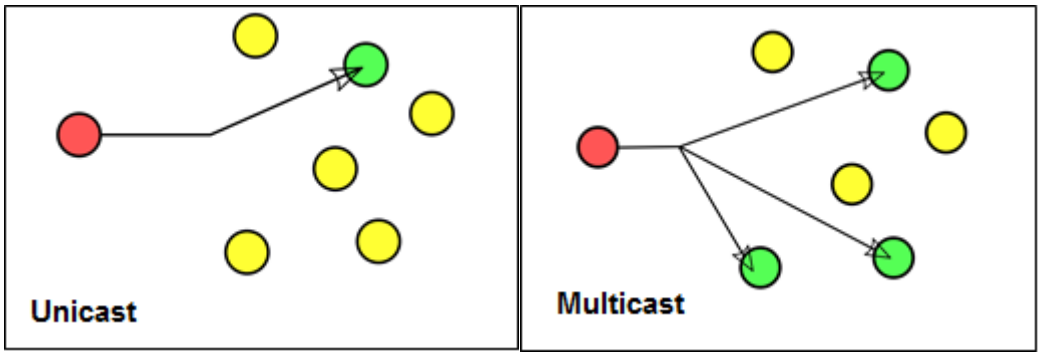

Figure 11. Unicast and multicast communication modes in a computer network. Adapted from Wikipedia, n.d., *Multicast page* and from Wikipedia, n.d., *Unicast page*.

MUHC Proprietary System

The information suite was purchased to answer two major needs. The first objective is electronic documentation of medical care throughout the pregnancy, labour and delivery, and neonatal period for both mother and infant. The second goal is to provide access to clinical data for clinicians of all care units, from the obstetrician's office, antenatal clinic, birthing centre, postpartum unit, and neonatal intensive care unit, to plan for treatment and follow-up.

The Department of Obstetrics project is being implemented in stages to gradually manage the change in practice. The first phase involves intrapartum electronic

capture of fetal monitoring tracings of its labouring patients. The second phase plans to include antepartum fetal tracings into the electronic patient record.

As multicast technology is not yet set up in the Québec government's réseau intégré de télécommunication multimédia (RITM), the mandatory technological structure was introduced at the MUHC in the clinical units instituting the obstetric software.

Extension of the MUHC Network for the NST Project

The goal of the project is access to electronic fetal tracings and documentation from diverse physical locations in asynchronous mode. The clinical criteria to be fulfilled are accurate uptake and visualization of clinical data, timely accessibility to this data, and exact transmission of documentation. The clinical information system purchased in 2010 by the MUHC Department of Obstetrics integrates these requirements. The NST project pre-empts the development of the second phase of the MUHC plan. One of the service corridors will also profit from the initial intrapartum portion of the integration. The Department of Obstetrics has agreed to share its software to its RUIS partners to optimize regional obstetric care.

The Centricity Perinatal workflow currently in use in the Birthing Centre pertains to a self-contained team. The obstetric nurses and physicians are co-located physically and enter data and document on the unit's dedicated computers.

In the telehealth project, the workflow is adapted to reflect the remotely-located nature of the requesting and providing clinicians. Figure 12 represents the

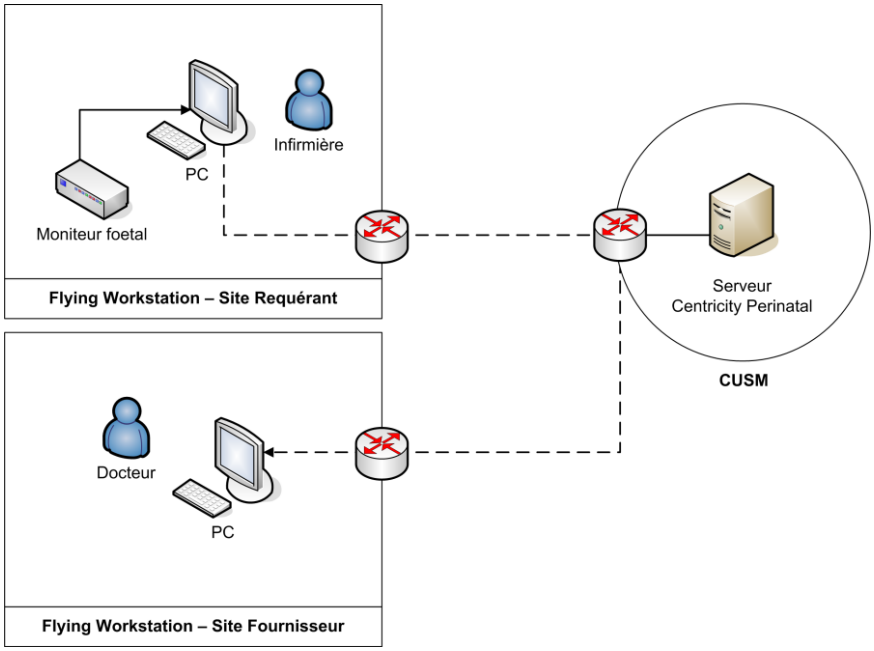

Figure 12. Centricity Perinatal software system communication pathway for the telehealth NST service. Adapted from Télésanté RUIS McGill, 2014, *20140116_rapport_etude-faisabilite.*

communication pathway between a requesting and a providing site for the NST service (Télésanté RUIS McGill, 2014, *20140116_rapport_etude-faisabilite [internal work document]*.

Even though the providing site would require only a dedicated computer to view the incoming clinical data, it was determined all telehealth sites would be equipped with identical solutions. The rationale behind this decision being that, as shown in Figure12, the Centricity Perinatal server is situated within the MUHC. All regional clinicians distantly access this server to upload and review clinical data. Similarly the MUHC obstetric team members log in to the same server and can also view the electronic records of the regional patients. All telehealth sites have the possibility of

requesting tertiary line services from the Department of Obstetrics in the event of clinical complexity, and as such should possess the required equipment.

Instructional Package Development Strategy

All facets and factors impacting the telehealth project having been analyzed, it is possible to forge an instructional strategy. The educational and training solution developed is the product of all clinical, technological, organizational, and information technology influencers.

To implement the fetal monitoring clinical application which will allow the electronic transmission of NST strips and their interpretation by remotely-located obstetricians, it is important to view the project in its network perspective. By this approach, the goals are to:

- Identify systems theory components – to understand current workflow organization and promote collaboration with the implementation of the change process
- Identify stakeholders at all locations – to optimize the change process by working with key personnel at the organizational, technological, and clinical levels
- Design and develop the instructional package

Systems Theory Components

Perceiving our project partners at the organizational, unit, and individual levels is a prerequisite to the success of the project. As Ackoff (1994) states, considering the

interaction of the parts of an organization as a whole brings understanding of its function. A healthcare establishment can be seen as a social system, with three levels of purposes: its own, that of its parts, and that of the larger system around it. Comprehension of these dependencies promotes identification of appropriate measures to optimize development of the system.

Health institutions are also complex adaptive systems, composed of individuals free to act predictably and unpredictably, and whose actions are interconnected with other individuals' actions, changing the context for all individuals (Plsek and Greenhalgh, 2001). As agents in the system can change, complex systems adapt over time. Learning can be tailored to promote the implementation of innovative care methods.

The non-linear behaviour of complex adaptive systems creates an agreement/disagreement certainty/uncertainty construct which influences one's desire and motivation to embrace change. Trial-and-error resolves this paradox with the most appropriate solution gaining attention over time to achieve adaptation (Plsek and Greenhalgh, 2001). This is the concept most pertinent to this study. While the content of the training material is identical for each site in order to transfer the appropriate knowledge, each individual, within his establishment will tailor his learning to best suit personal needs, clinical practice and institution goals. Integration of the new service will occur naturally according to each site's reality. The teaching goal is to deliver the information, offer fluidity in support measures, and favour local appropriation of the clinical service.

In summary, the steps leading to effective change in organizations are:

- Creating a clear compelling vision
- Bringing the change vision to the level of the impacted group
- Encouraging the adoption of the change at the individual employee level
- Maintaining the momentum of the implemented change
- Institutionalizing the change (Whelan-Berry and Somerville, 2010)

Identification of Stakeholders

The vast extent of the project gives rise to inherent complexity in the identification of stakeholders. Working with four sociosanitary regions compounds the task, as each has its own organization at the regional and establishment level. The reality of high personnel turnover adds additional challenge to the undertaking. The administrative, technological and clinical aspects of the deployment plan demand a multiplicity of key persons.

Although the objective of this thesis equivalence is to narrate the educational segment of the NST service, it is of interest to be aware of the workplace structure that will appropriate the project. Understanding the behind-the-scenes set-up of the service is essential to configure the training program to best respond to learning needs. Local context has a key role in the effectiveness of implementation strategies (Moore et al., 2014). Tailoring interventions is effective in adapting change to a specific environment.

As the clinical coordinator, I periodically entered into contact with all participants to ensure status progression. These interactions identify organizational details, which inform of the local and system contexts, guiding the personalization of the training (Standing and Cripps, 2015).

A description of the three levels of contributors presents the challenges of managing the realities of multilevel projects.

Administrative level. Telemedicine projects must be in agreement with organizational strategy (Lockamy and Smith, 2009). This strategic alignment guarantees that objectives are driven by patient needs, and that telemedicine processes create customer value and facilitate the realization of these objectives. A definite critical success factor is innovative and committed leadership with a willingness to problem-solve and invest resources through hands-on involvement (Kaye et al., 2010).

During the planning phases of the project, all regional telehealth leaders within the McGill RUIS were approached to establish their need and/or capacity to partake in the NST project. The regions accepting to undertake the project delegated its realisation to representatives at each of the selected sites. According to the local hierarchical structure, a clinical and a technical contact person were selected in each establishment. These champions are responsible for the local deployment of the telehealth solution.

Technological level. For the technological preparation, IT and biomedical personnel are required for the network and equipment configuration. The larger health establishments have dedicated staff for these departments, who are responsible for all local activities. In some regions, one resource combines both roles and covers all the institutions of its territory. Careful planning of the work schedule is necessary to promote collaboration of the agents.

Clinical level. Each site implementing the NST project has its own local organization for care delivery to its clientèle. The attribution of the new tasks to staff varies greatly from one centre to another. This entails the training program will be offered to administrative assistants, nurses, nursing assistants and physicians.

Instructional Package Design, Development, and Delivery

Design. Central components of the instructional design process are the identification of:

- the behaviours to be learned
- the skills and knowledge to be developed in order to master the desired behaviours
- the motivators and inhibitors to the adoption of the desired behaviours (Carliner, 2003)

Learning produces change. It is interesting to link these elements of the instructional systems development (ISD) process with change management concepts to facilitate the adoption of novel workplace practices. The diffusion of innovations theory adapted to healthcare settings provides an understanding of technology acceptance

by clinicians (Gattoni and Tenzek, 2010). Diffusion of technology into the social system occurs in five steps:

- knowledge, as one learns of the technology and understands its working
- persuasion, as one forms a mental impression of the technology
- decision, where one acts to accept or reject the technology
- implementation, where one learns to use the technology
- confirmation, as one evaluates benefits and consequences of the technology

Designing training to incorporate both learning and change concepts enhances performance which can lead to successful buy-in to the project. Learner-centered and performance-based instruction concentrates on individual needs and desired outcomes to achieve a change in behaviour (Stolovitch and Keeps, 2004).

Effective training meets learning and change standards by evaluating and measuring needs and performance criteria (Carliner, 2003). The ADDIE model is the chosen instructional design process for the development of the training materials. The five generic steps of analysis, design, development, implementation, and evaluation represent the systematic approach to ISD, adaptable to each specific project (Molenda, 2003).

Abdous and He (2008) paired the ISD process with project management software. The telehealth project is complex in regards of its many concurrent dependent tasks, its lengthy timeline, and the number of human resources sharing the workload. The use of a project management software proved a meaningful tool to enhance the collaboration of the educational, clinical, and technological contributors

of the initiative. It promoted the coordination of the ISD process with technological readiness as each site became operational.

Development. The clinical coordinator is the sole team member to have access to the Centricity Perinatal software in the telehealth department. My past clinical experience in the MUHC Birthing Centre with the obstetric software, coupled with my knowledge of telehealth obligations and procedures, facilitated the development of the educational clinical content.

Offering a variety of instructional approaches provides a flexible learning experience (Thomas, 2012). Print-based, video and online course materials will be available on the telehealth website to support learners.

The instructional package consists of a description of the telehealth NST workflow, an informative summary of the electronic fetal monitor settings required by the obstetric software, a practical manual on the use of the Centricity Perinatal clinical software and a summative evaluation of the instructor and of the training package.

Delivery. The 18 communities participating in the project and the telehealth department are geographically dispersed. As all sites are equipped and familiar with videoconferencing technology, a distance education scheme imposes itself as the delivery method of choice. Video-lectures can improve distance learning experiences by enhancing the social aspects of learning through student interaction (Geri, 2012).

The course registration process is sign-up to one of the predetermined sessions according to participant availability. This sign-up formula has the benefit of mixing

learners from requesting and providing sites of different establishments. Group interaction and discussion of the content, workflow and coordination strategies are favoured and promote project implementation.

Methodology

Research Objectives

The main research objective examined in this work is:

- What are the steps required to design, develop, deliver, and evaluate a distance education program for a new telehealth clinical service implemented by the Clinique virtuelle de Santé et de Services Sociaux?

The related sub-objectives are:

- What is the current plan of care for patients living in remote areas with high-risk pregnancies?
- What is the desired plan of care for patients living in remote areas with high-risk pregnancies to be developed through telehealth technological and clinical services?
- What changes in clinical practice are required for the clinicians involved in the new telehealth service?
- What changes in technology are required to implement the new telehealth service?
- What are the learning needs of the clinicians involved in the new telehealth service?

- What are the learning needs of the administrative personnel involved in the new telehealth service?
- What is the optimal process to promote change in obstetric clinical practice during the implementation of an obstetric telehealth service?
- What is the best instructional strategy to deliver the training program to the clinicians and administrative personnel?

Research Design

The official launch of our telehealth clinical services occurred in July 2012. Each clinical service has been developed specifically for the needs of the patients and clinicians. The research will describe the transition process involved in the introduction of a telehealth program for high-risk pregnancy patients residing in isolated communities in Northern Québec. This obstetric health informatics project is a pioneering approach to high risk antenatal care for isolated populations.

While reviewing the literature to select a research design for this study, the innovative nature of telehealth played a major role in my choice. The emerging processes and outcomes at play in telehealth services are still to be thoroughly researched. Qualitative research is well indicated to start identifying the variables at play (Creswell, 2012).

Among the several options in qualitative designs, an ethnographic approach is suited to the nature of the topic. An ethnography focuses on describing a cultural group in a selected aspect of their routine lives (Muecke, 1993). Here the adaptation of the clinical and administrative personnel involved in the obstetric care of high risk

pregnancy patients living in outlying regions will be observed. The research will describe the process of clinical, educational, and organizational change occurring during the addition of telehealth in the delivery of obstetric care.

The literature reveals that focused ethnography is specifically helpful in the observation of healthcare practices. Focused ethnography, as described by Cruz and Higginbottom (2013) is a methodology oriented by one researcher that looks into a context-specific phenomenon, of interest to a discrete community of participants. Figure 13 represents the characteristics of focused ethnography as originally described in Muecke (1993). This applied research design is best conducive to meeting the objectives of the thesis equivalence. To examine this innovative antenatal care project, its objectives, its milestones, and final outcomes, focused ethnography will describe the steps from initial evaluation of the project request, to feasibility testing and service deployment, and on to the design and development of a training manual on the clinical technology and application involved in the project.

Data Collection

Ethnography generally employs three data collection strategies: participant observation, formal and informal interviews, and examination of relevant documents (Cruz and Higginbottom, 2013). Table 2 presents the features and data collection methods of focused ethnographies performed in healthcare settings (Higginbottom et al., 2013).

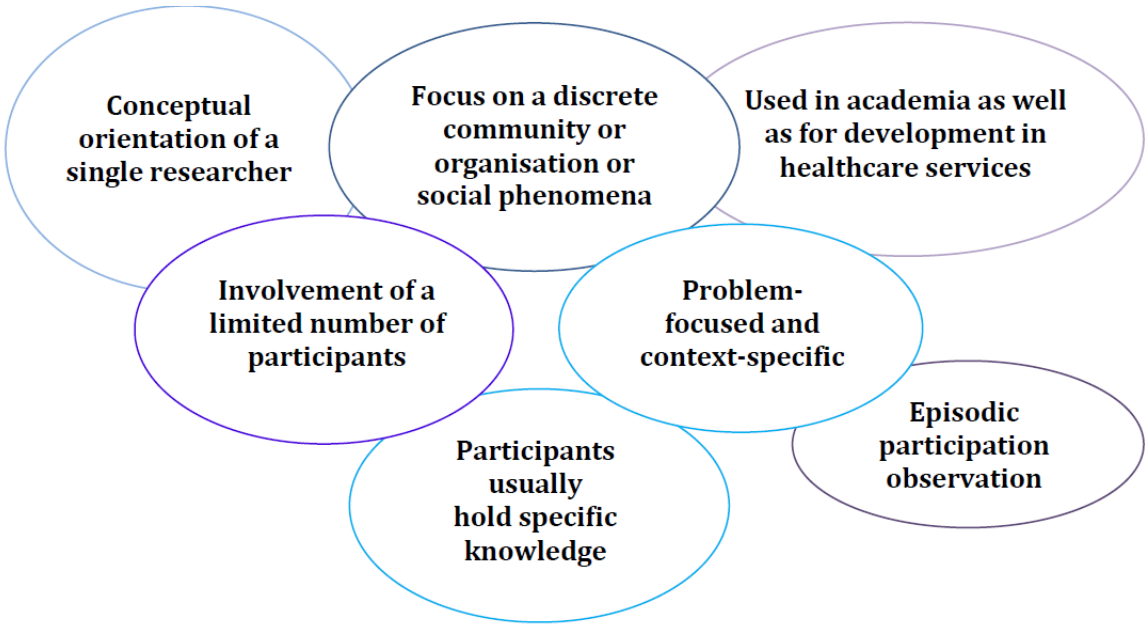

Figure 13. Characteristics of focused ethnography. Adapted from Higginbottom et al., 2013.

Table 2

Features and data collection methods in healthcare focused ethnographies

Collection methods used in this study
Purposeful study of a specific aspect of the field
Informants with knowledge and experience are key participants
Field of investigation closed to the research objectives
Intermittent and purposeful field visits at particular timeframes or events
Background knowledge informs research objectives
Data analysis intensity with various recording devices
Data sessions with other researchers knowledgeable of the research goals

The distinct phases and milestones of the NST project are well suited to targeted and specific observations of a limited number of informants. Several members of

the telehealth team have periodic contact with stakeholders and key personnel in the various locations involved in the project.

Participant observation. Observation activities are conducted through face-to-face, telephone and videoconference meetings, as participants are collocated as well as remotely-located.

Regional partners. As my principal role in the project is to design, develop, and deliver the training material, my own contact with the learners will be mostly during the teaching sessions given by videoconference. Other members of my team interact regularly with the various regional partners. Therefore, the optimal participants for my study are my coworkers. This research will concentrate on interviewing telehealth personnel.

MUHC obstetric clinical software specialist. A key informant is the obstetric clinical software specialist responsible for training and deployment of the solution within the Women's Health division of the MUHC. Close collaboration with this partner proved essential to obtain critical information for the training portion of the project.

Telehealth staff. The telehealth team consists of managers, project managers, computing engineers, event coordinators, technicians, and clinical change agents. Each is responsible for implementing the portion of the project relative to their specific field, and act periodically according to the established timetable. Each also works in collaboration with their respective contact persons in the regions.

For this study, the participants will be managers, project managers and clinical change agents. These teammates are key players as they communicate with the

regional partners that will locally implement the project, and identify the personnel that will follow the course and provide the service.

The technical members of the telehealth team have a major role in preparing the technological and IT portion of the project, but are less suited to contribute to this specific study. As this research will focus on the educational and change management needs of the clinical and administrative personnel who will be pioneering this new telehealth service, my team's managers and clinical change agents will mostly be solicited as study participants.

Informant interviews. As my role is dual in that I am both the clinical coordinator for the telehealth project and the researcher for this work, most data is derived from my own experience. Several interviewing processes are utilized in this study.

One-on-one interviews were conducted with the chief project manager, the technological project manager, the clinical change agent and the MUHC obstetric clinical software specialist. Data collection centered on progress reports and coordination of timely production of deliverables for concurrent and sequential phases of the project.

Regular group interviews were performed with the telehealth team to share individual member progress to the group and discuss strategies to maintain development and deployment objectives.

Other interview methods were more spontaneous and informal in nature. Notes were taken during impromptu coordination meetings, spontaneous hallway one-on-

one quick project updates, and internal emails and phone calls with members of the project team.

Document observation. Examination of relevant documents is another major source of data for this study. External source and telehealth documents provided information on identified needs, service offer, project coordination, training package development and change management provisions.

External documentation for the portion of the project relevant to this research originates from two sources. General Electric provided clinical, technical, and training documentation on its obstetric clinical software. The MUHC obstetric clinical software specialist shared print documents and electronic files relevant for software personalization and implementation, and user access and training.

The telehealth team has produced several documents in order to enhance internal and external communication, ensure project advancement, and share project updates. Consultation of documents favoured alignment between project goals, dependency coordination, and training package deliverables.

Data Analysis

Data analysis in ethnographic studies is interested in understanding meaning or providing description of the collection of data (Savage, 2006). The aim is to link action with context and surrounding culture. Validation of findings is determined through triangulation and member checking.

Data is initially organized for coding. Relevant codes are aggregated into main themes, which are examined in the discussion section of this work. Data analysis and interpretation of results derives mainly from my subjective evaluation of the data. As in all ethnographic work and opposed to quantitative research, making the effect of the researcher explicit and transparent is the aim of self-conscious reflection (Cruz and Higginbottom, 2013). Discussion of the results will identify when my personal experience might influence data interpretation.

Triangulation of data is performed to corroborate information collected from different team members, partners, and documents to increase findings accuracy (Creswell, 2012 and Higginbottom et al., 2013).

Member checking is performed with a telehealth manager and the project manager to further determine accuracy of results.

Results

Timeline

The project is presented according to its 2 major stages:

- Feasibility test – from May 16, 2011 to October 31, 2013
- Project deployment – from November 1, 2013 to present time

Figure 14 provides a general chronological overview of the strategic, technological, clinical and educational activities involved in both stages.

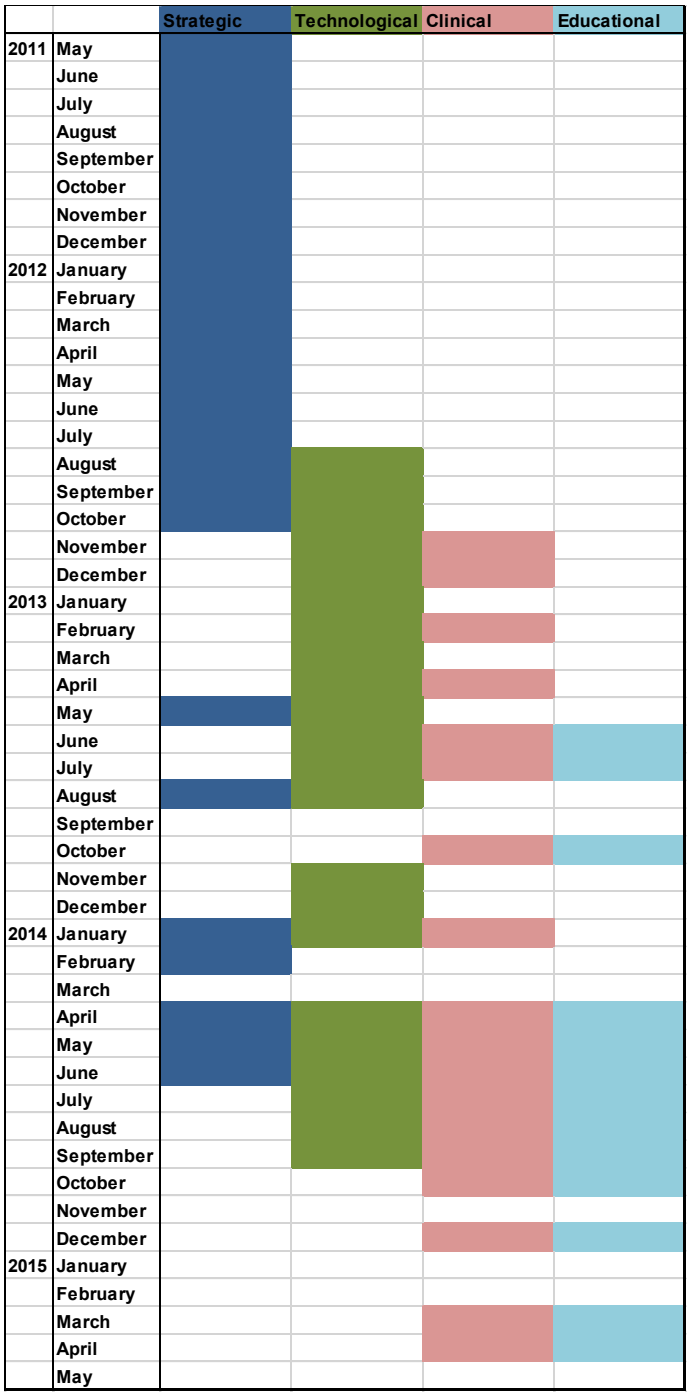

Figure 14. General chronological overview of strategic, technological, clinical and educational activities of the NST project.

Milestones

- May – October 2011:
  - Letter of intention from the MUHC Obstetric Department agreeing to share the GE Centricity Perinatal obstetric software with interested McGill RUIS regional partners
  - Letter of intention from the Cree Board of Health and Social Services of James Bay agreeing to adhere to the proposed clinical project
  - Proposition from GE Healthcare to extend the MUHC agreement to the telehealth project
  - Analysis by the telehealth team of 3 existing software solutions for the electronic transmission of NST tracings (Huntleigh Healthcare, Philips Healthcare, GE Healthcare)
  - Analysis by the telehealth team of potential alternative solutions for the method of transmission of NST tracings
- November 2011 – February 2012:
  - Agreement between GE Healthcare, the MUHC and the telehealth department for the temporary provision of Centricity Perinatal thick-client licences and for the collaboration of GE resources (manager and IT specialists) for the feasibility test
- March – October 2012:
  - Approval of the Direction générale des technologies de l'information du ministère de la Santé et des Services sociaux of the request for exemption permitting the creation of a multicast virtual private network

(VPN) between the MUHC, the Val-d'Or hospital and the Chisasibi hospital

- August 2012:
  - Purchase and IT configuration of multicast routers
- August 2012 – August 2013:
  - Decompartmentalisation of the MUHC IT network for the Val-d'Or and Chisasibi hospitals
- November – December 2012:
  - Purchase and configuration of a Centricity Perinatal compatible electronic fetal monitor
- February 2013:
  - Installation of Centricity Perinatal on 2 dedicated laptops
  - Loan of the electronic fetal monitor and both dedicated laptops to the Val-d'Or hospital
  - Creation of a MUHC – Val-d'Or hospital multicast network
- April 2013:
  - Centricity Perinatal product evaluation
- May 2013:
  - Extension of the GE – MUHC – telehealth department agreement until October 2013
- June 2013:
  - Creation of a cursory Centricity Perinatal guide for the clinical feasibility test

    - Development of a clinical test protocol
    - Identification of clinical success criteria
- July 2013:
    - Training of a Val-d'Or nurse on the Centricity Perinatal software
    - Selection of a test patient
    - Clinical feasibility test with the Val-d'Or hospital as requesting and providing sites
    - Loan of the electronic fetal monitor and of one of the 2 dedicated laptops to the Chisasibi hospital
    - Creation of a MUHC – Chisasibi hospital multicast network
- August 2013:
    - Change request made to the MSSS to extend the scope of the CvSSS project to include the NST service project
    - Approval of the change request by the MSSS
- October 2013:
    - Training of a Chisasibi nurse on the Centricity Perinatal software
    - Selection of a test patient
    - Clinical feasibility test with the Chisasibi hospital as the requesting site and the Val-d'Or hospital as the providing site
- January 2014:
    - Feasibility test report submission
- February 2014:
    - Presentation of the NST project to additional potential sites

- April 2014:
    - Identification of possible mobile ‘all-inclusive’ solutions for the NST clinical equipment
- April – May 2014:
    - Call for tenders for NST solution clinical equipment (electronic fetal monitors, laptops, carts)
- April – June 2014:
    - Formal commitment of 8 additional sites to the NST project
    - Approval of project IT requirements by the local and regional IT security officers of all project sites
    - Creation of multicast VPNs between the MUHC and each project site
    - Identification of clinical patient areas by the participating sites
    - IT and network configuration of identified NST service clinical areas
    - Design and development of instructional NST service package
- July – August 2014:
    - Assembly and delivery of the NST clinical carts for phase 1 sites
- July – October 2014:
    - Adaptation of the Centricity Perinatal software to the telehealth project needs
    - Design and development of English – French Centricity Perinatal software translation documents
- August – September 2014:
    - Delivery of training package to phase 1 sites

- September 2014:
    - Assembly and delivery of the NST clinical carts for phase 2 sites
- October 2014:
    - Delivery of training package to phase 2 sites
- December 2014:
    - Clinical pretest at the Matagami – Lebel-sur-Quévillon – Amos service corridor sites
- March 2015:
    - Clinical pretest at the Ville-Marie site
- April 2015:
    - Clinical pretest at the Chisasibi site

Feasibility Test Modalities

Goal. The main goal of the feasibility test was to validate the possibility of extending the MUHC Centricity Perinatal network to partner regions while maintaining acceptable clinical quality of the NST signal transmission.

Equipment. The required equipment consists of an electronic fetal monitor, 2 dedicated laptops installed with appropriate licences, and necessary cabling. Table 3 lists the specific technical needs according to the clinical telehealth role of the site. All items were purchased and/or lent to the participating sites by the telehealth team. The estimated cost of the materials is 14000 $.

Table 3

Specific technological supplies required at requesting and providing telehealth sites

Requesting site	Providing site
Multicast router	Multicast router
Laptop	Laptop
Centricity Perinatal licence	Centricity Perinatal licence
Citrix licence	Citrix licence
Electronic fetal monitor	

Stakeholders. Several stakeholders were involved in the feasibility test. Table 4 presents the range of collaborators in each work team. Coordination was planned between the respective teams by the telehealth project manager.

The telehealth project manager held weekly status meetings with the GE Healthcare project manager and Centricity Perinatal specialist in order to clearly share completed tasks and plan subsequent steps. The MUHC Centricity Perinatal administrator, the GE electronic fetal monitor specialist and the telehealth clinical coordinator participated in the telephone conference meetings when pertinent.

Table 4

Function of feasibility test participants by work team

Telehealth team
Project promoter
Project coordinator
RUIS McGill clinical advisor
Clinical coordinator
Network analyst
McGill University Health Centre (MUHC) team
Centricity Perinatal administrator
Network analyst
GE Healthcare team
Project coordinator
Centricity Perinatal specialist
Electronic fetal monitor specialist
Val-d'Or Hospital team
IT systems analyst (2)
Biomedical engineer (2)
Birthing Centre head nurse
Chief obstetrician
Regional technocentre network analyst
Chisasibi Hospital team
IT systems analyst
Biomedical engineer
Nursing manager
Nurse
Regional technocentre network analyst

Tasks. The technological tasks such as setting up the multicast network, physically preparing the clinical area and testing the communication pathway between the distant site and the MUHC Centricity Perinatal server were first performed with the Val-d'Or team. As the initial location for this segment of the test, Val-d'Or acted as both requesting and providing sites. The clinical portion of the trial was realized with a test-patient, an obstetric nurse and an obstetrician. Clinical validation in regards to quality of NST transmission and user experience completed the test. The success criteria identified in Table 5 were met to satisfaction. The main criterion was the validation of the electronic version of the electronic fetal monitor paper tracing. Both the nurse and the obstetrician evaluated the Centricity Perinatal tracing to be of adequate quality and accuracy as the paper tracing. Figures 15 (RBMC Ob&Gyn Supplemental Info, n.d.) and 16 (GE Healthcare, n.d., Centricity Perinatal page) present the paper and electronic versions of an NST tracing.

From the lessons learned with the Val-d'Or experience, the technological set-up recipe was fine-tuned to replicate the tasks at the Chisasibi hospital. In this final portion of the feasibility test, Chisasibi was the requesting site and Val-d'Or the providing site. A second test-patient and a women's health nurse carried out the NST activity. The Val-d'Or obstetrician completed the clinical duties. The success criteria were again met to satisfaction.

Table 5

Clinical success criteria for the NST project feasibility test for requesting and providing telehealth sites

Requesting site	Providing site
Clinicians visualize the NST tracing in the Centricity Perinatal application	Clinicians visualize the NST tracing in the Centricity Perinatal application
Data capture in Centricity Perinatal permits appropriate transmission of clinical information	Data capture in Centricity Perinatal permits appropriate transmission of clinical information
Electronic NST tracing in Centricity Perinatal is estimated to be of equal quality as the paper tracing emitted by the electronic fetal monitor	Electronic NST tracing in Centricity Perinatal is estimated to be of equal quality as the paper tracing emitted by the electronic fetal monitor
	Interpretation of electronic NST tracing in Centricity Perinatal meets clinical quality standards
NST report is accessible in Centricity Perinatal	NST report is accessible in Centricity Perinatal

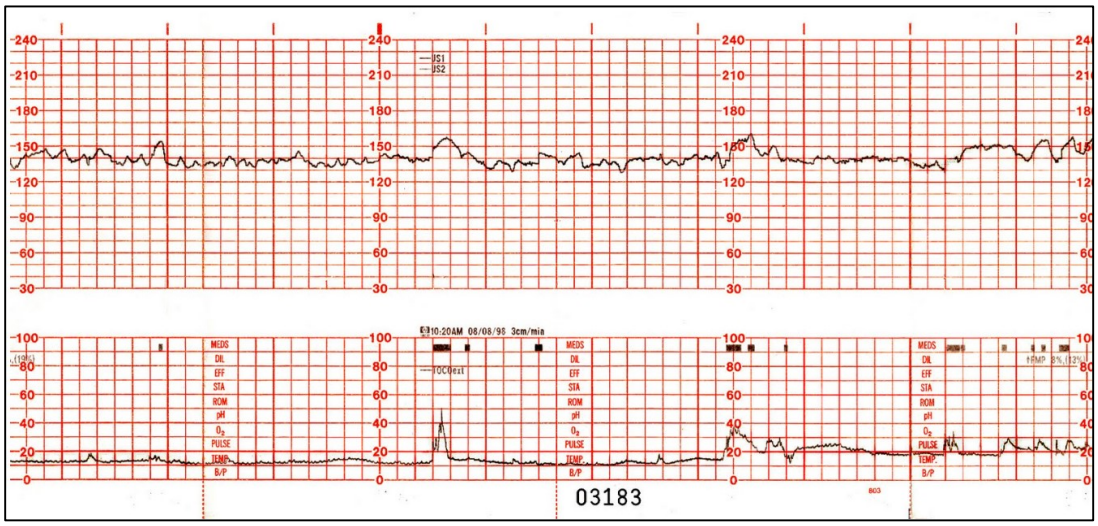

Figure 15. Example of paper non stress test tracing. Adapted from RBMC Ob&Gyn Supplemental Info, n.d.

Figure 16. Example of Centricity Perinatal electronic non stress test tracing. Adapted from GE Healthcare, n.d., *Centricity Perinatal page*.

Project Deployment Modalities

Goal. The goal of the deployment phase is to functionally extend the MUHC Centricity Perinatal network to include all telehealth project sites. The procedure matured during the feasibility test was applied to all partner establishments.

Equipment. The materials for the NST service remained identical to those described in Table 3. Several sites wished flexibility to offer the NST service to their clientèle in various clinical settings within their establishment. As the telehealth project consents to one single NST package per site, a portable cart to house the clinical components of the solution was added to the list of equipment.

A compact mobile all-in-one kit was designed to enhance comfort of handling for users while respecting the limited space available for new clinical equipment in patient areas Each site can place the cart according to local needs as long as the room has been configured as per IT, network and Centricity Perinatal requirements.

Figure 17 shows the NST cart distributed to all sites. Projected budget was estimated at 365000 $. The real project cost was under 325000 $.

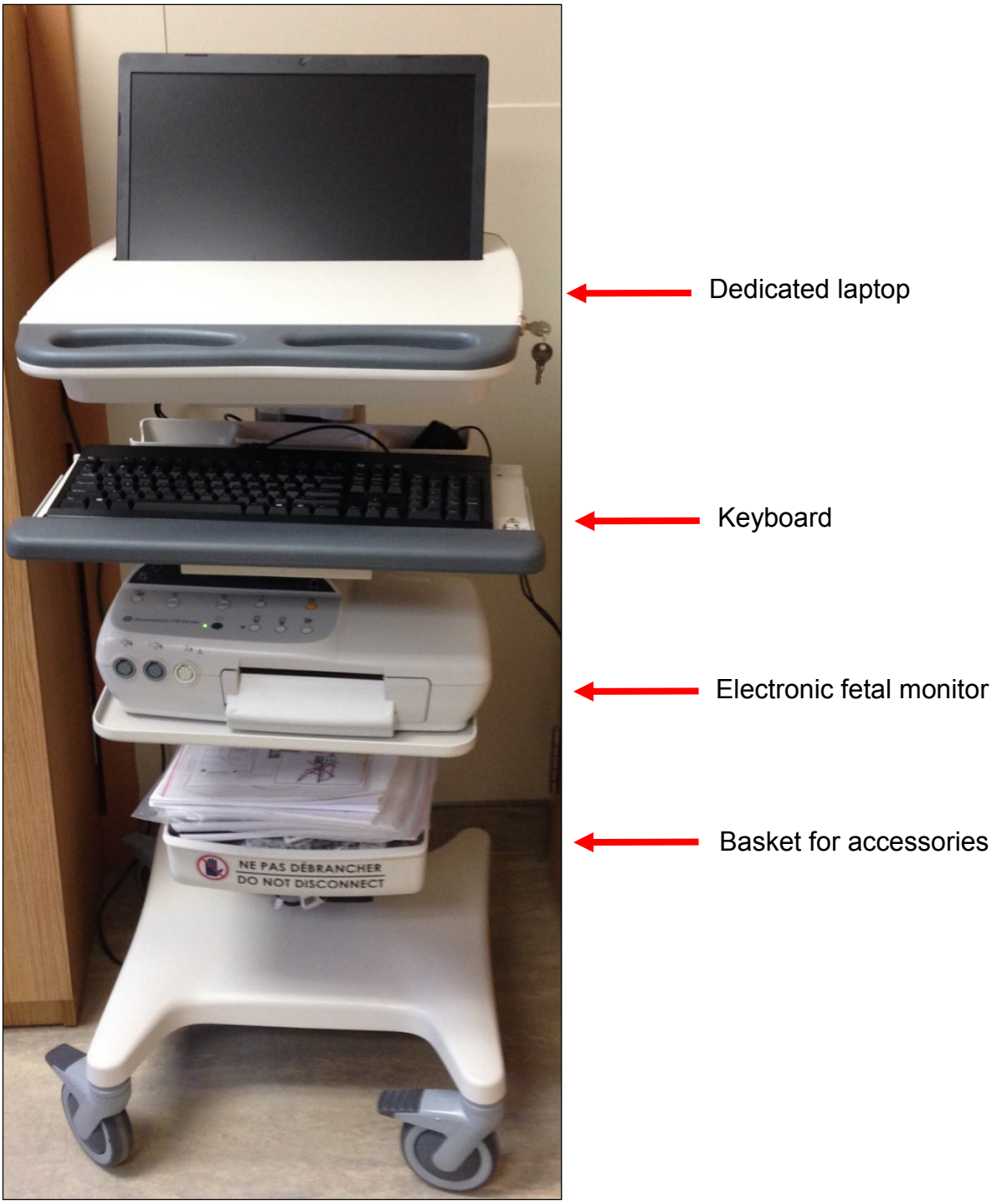

Figure 17. Telehealth NST mobile cart solution.

Stakeholders. Stakeholders for the technological and clinical aspects of the deployment phase were identified for each additional site. The respective functions of collaborators within their local institution remain the same as those recorded in Table 4.

Telehealth team members that participated in the feasibility test retained their roles during the deployment period. The scope of the project having been widened and the initial service launch deadline set and remaining for March 31, 2015, an additional resource was allotted to the telehealth team. The new project leader's mandate was organizational strategy, coordination and communication duties. The project leader managed the call for tender, collaborated with the winning equipment provider, dealt with the required inter-establishment legal and clinical agreements, and handled all communications with project partners.

Tasks. Development was planned in several steps according to region and health service corridor readiness to engage in the NST service implementation.

An NST clinical workflow (Appendix A) integrating the use of Centricity Perinatal was designed by the telehealth team. The workflow was submitted to each site engaged in the project to allow local clinical teams to personalize the details and identify the persons to perform the steps. The final approved process became the foundation upon which the instructional package was tweaked for each health service corridor.

Currently all equipment has been received by the regional healthcare establishments. Network and IT configuration is completed at all sites. Clinical readiness has been demonstrated in Amos, Chisasibi, Lebel-sur-Quévillon,

Matagami, Ville-Marie and Val-d'Or. The remaining sites are being clinically activated or will be subsequently.

Training. Design and development of the instructional package was the responsibility of the telehealth coordinator. A connection to the MUHC multicast network was created to allow installation of the Centricity Perinatal software on her worksite computer.

The ADDIE process was applied to create the content of the learning materials. Familiarization with the application, its background structure, and its navigation rationale was a mandatory step for the design process. Strong with this acquired knowledge, course content was developed to match with the defined telehealth NST clinical workflow. Production of the learning materials was carried out by using Microsoft PowerPoint for the authoring tool. A test-patient was created in the obstetric software and was used to simulate the navigational tasks required in the NST workflow. A screenshot of each specific step of the procedure was taken and saved into Microsoft Paint. The portion of the screenshot pertinent to the task being explained was selected and copy-pasted into a PowerPoint slide. The applicable instructions were typed into a text box, with an arrow pointing to the related software fields. This sequence was repeated for each of the navigational steps. The resulting PowerPoint file became an easy to follow reference guide of the electronic portion of the workflow. Clarity of content was pilot-tested with a clinical telehealth colleague. This team member was not involved in the NST project and thus could provide opinions and comments on the material as an uninitiated participant.

The training program on the Centricity Perinatal software (Appendix B) was developed to meet the learning needs of all participants. The informative guide on the electronic fetal monitor's parameters (Appendix C) was created to respond to the configuration knowledge needs of certain sites not yet familiar with fetal monitoring. All requesting sites' clinical information needs on the execution of an NST were handled by the site's providing establishment.

The program's presentation was designed so the learner can select the chapters related to his own particular role. Live teaching sessions were provided by videoconference on the Centricity Perinatal application, the parameter settings of the electronic fetal monitor and its related clinical workflow. Personnel were invited to register to prescheduled instruction periods. Sessions were offered at various times during the day in order to facilitate enrolment of clinicians working on day/evening/night shift rotations. Figure 18 summarizes the data on sessions, sites, and participants for the August - September 2014 training period and Figure 19 presents the identical data for the October 2014 period. Training was received by a total of 86 persons.

A video recording was done of a training session and placed online on the telehealth portal for future reference. The course documents and service organizational literature are also available in pdf format on the telehealth website as support media for users.

Summative assessment of the training was obtained through an evaluation questionnaire (Appendix D). Evaluation of the global utility of the teaching sessions

Bilan des formations TRF par visioconférence - groupe 1							
Jours de formation	Heure	Val d'Or	Rouyn Noranda	Ville-Marie	Winneway	Chisasibi	Total
26 août	14 h-15h30	3	2				5
	16 h-17h30	4					4
27 août	8 h- 9h30	2	2			3	7
	14 h-15h30	7	3	1	2		13
	16 h-17h30			2	1		3
28 août	8 h- 9h30	0	3				3
	14 h-15h30	2					2
29 août	14 h-15h30	2					2
	16 h-17h30	2					2
2 septembre	14 h-15h30	3					3
3 septembre	14 h-15h30	2	4				6
	16 h-17h30		2		1		3
4 septembre	8 h- 9h30	4					4
5 septembre	8 h- 9h30			2			2
	14 h-15h30			2		1	3
	Total	31	16	7	4	4	
						Grand total	62

Figure 18. August – September 2014 Centricity Perinatal telehealth NST service training sessions by site and number of participants.

Bilan des formations TRF par visioconférence - groupe 2						
Jours de formation	Heure	Matagami	Amos	Lebel-sur-Quévillon	Chibougamau	Total
22 septembre	14 h-15h30	4				4
23 septembre	14 h-15h30		3			3
	16 h-17h30			3		3
24 septembre	8 h- 9h30		4			4
25 septembre	14 h-15h30				1	1
	16 h-17h30		5		1	6
26 septembre	14 h-15h30				3	3
	Total	4	12	3	5	
						Grand total 24

Figure 19. October 2014 Centricity Perinatal telehealth NST service training sessions by site and number of participants.

is 73.3 % when considering learner responses ranging from useful to excellent. Figure 20 presents learners' evaluation of the training chapters. All modules were positively viewed by the participants. Information on the electronic fetal monitor Centricity Perinatal-compatible parameter settings was strongly considered non-pertinent by 75 % of the learners.

Two rounds of qualitative coding analysis of respondents' replies to the evaluation form's open-ended questions generated 15 initial concepts. A third round resulted in grouping of these concepts into 3 main themes, each with related sub-categories. Figure 21 visually represents the results of the data analysis process.

It was decided with the MUHC Centricity Perinatal administrator and the telehealth project promoter that the CECoT is responsible for NST service first-line support. CECoT event coordinators will collect the user's name, site and request in order to appropriately transfer the inquiry to a technological or clinical telehealth team member. A training document for telehealth technicians was produced in identical fashion as the Centricity Perinatal instruction guide (Appendix E). A continuity plan and other internal procedures were created to inform the team of the clinical need and rationale behind the project, provide knowledge on Centricity Perinatal IT and network structure, and introduce their role and responsibilities in the continuity plan. In-person information sessions were separately conducted with the CECoT event coordinators, the telehealth technicians, and the clinical coordinator backup person. The telehealth technician teaching was concurrently offered by videoconference and video-recorded for future consultation. Figure 22 presents details on the internal

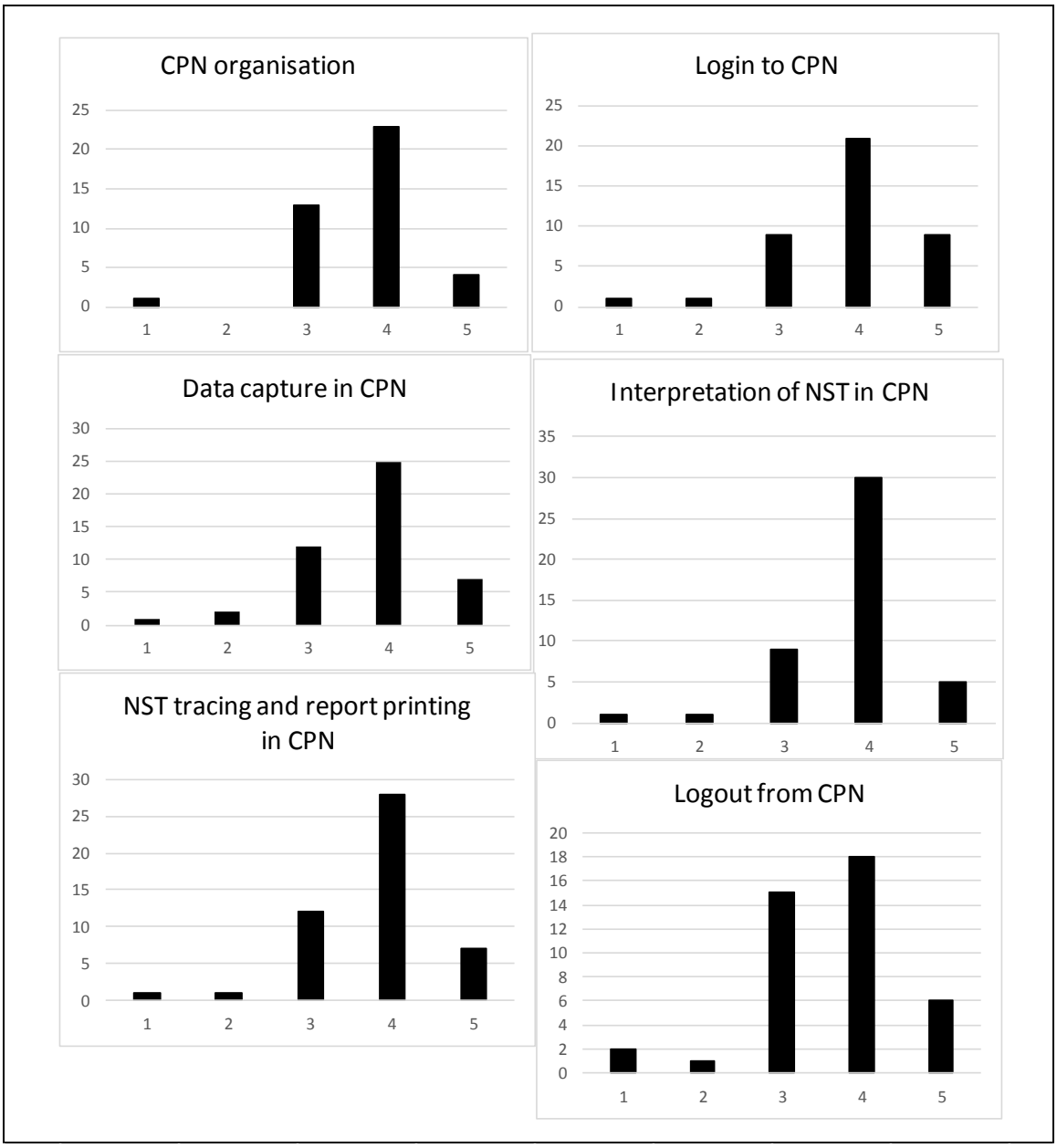

Figure 20. Learners' evaluation on a Likert scale of 1- 5 of the Centricity Perinatal (CPN) training chapters. Likert scale ranges from: 1 = non useful, 2 = slightly useful, 3 = useful, 4 = helpful, 5 = excellent.

training sessions. A total of 10 persons benefited from the training. Verbal evaluation of the information/teaching sessions was received and was positive.

NST service	Training package	CPN navigation
• Project overview • Service benefits	• Overall assessment • Presentation organisation • Documentation quality • Course improvement suggestions • Post-training support • Comments on instructor • Delivery method	• Relevant tasks • Irrelevant tasks

Figure 21. Major themes and sub-categories identified through coding of responses to open-ended questions contained in the evaluation questionnaire of the Centricity Perinatal training program.

Bilan des formations TRF par visioconférence/en personne - télésanté							
Jours de formation	Heure	Télésanté	Total				
10 octobre	10h30 - 11h30	1	1	coordonnatrice clinique - backup			
17 octobre	13h30 - 14h30	6	6	techniciens télésanté			
17 novembre	10h - 11h	3	3	coordonnateurs d'évènements CECoT			
	Total	10					
				10		Grand total	10

Figure 22. October – November 2014 telehealth NST service support training sessions for members of the telehealth team.

Documentation

Documentation was inherent in all stages of the project feasibility and service deployment phases. Reporting served to present project and service results to the

project promoter, MUHC and regional partners, the MSSS and the involved telehealth team associates.

Traceability of learnt processes was instituted to facilitate support of the service and allow replication of deployment procedures to possible future regional partners. Table 6 lists the various materials produced according to their intended audience and use. Figure 23 summarizes the steps of the NST service deployment workflow.

Project Media

During the course of the project, numerous media were utilized to optimize transmission of communication, task reporting, scheduling, project planning, training design and delivery and documentation. The media I used during the course of the project to fulfill the tasks encountered as clinical coordinator are presented in Table 7.

Discussion

The non stress test service is deployed in many of the project sites since fall 2014. Although few NSTs have yet been realized, many lessons have been learned over the 4 years of this telehealth activity's implementation process.

The collected data is dissected through the multiple lenses of my roles in this study. Having the perspectives of an educational technology student and researcher, as well as of a telehealth clinical coordinator with past experience in high risk obstetric nursing has favoured a unique integration of concepts that are discussed in this section. Notions and insights are grouped and presented under 6 themes,

Table 6

Document production for NST service

Internal telehealth work documents
Evaluation report of the Centricity Perinatal software
Feasibility test report
Feasibility test clinical evaluations
Overview of offer of service
Partner contact list
Training session calendar
Regional sites training summary
Centricity Perinatal support procedure
Legal documents
Request for change to the MSSS
MUHC Centricity Perinatal software sharing agreement
Inter-establishment clinical agreements
Organizational documents
Clinical workflow
NST clinical guide
Centricity Perinatal profile request form
Procedure to request access to Centricity Perinatal
Continuity plan
New site addition request procedure
NST service deployment workflow
Training package documents
Centricity Perinatal software training manual
Centricity Perinatal software translation guide
Electronic fetal monitor Centricity Perinatal parameter settings
Telehealth technician training module
Clinical informative documents
Clinical NST protocol
NST result decision tree
NST tracing and report archiving protocol

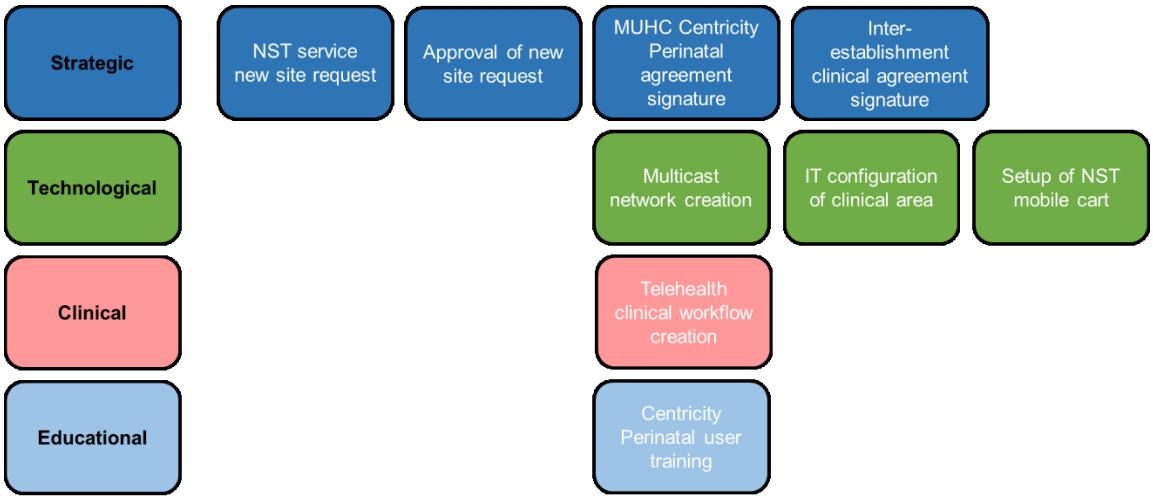

Figure 23. Summary of telehealth NST service deployment workflow.

Table 7

Media used during the NST project phases by the telehealth clinical coordinator

Communication media
Telephone – office and cellular
Lotus Notes email software
Postal service
Electronic bulletins
Voice communication
Telehealth portal
Authoring tools
MS Word, Excel, PowerPoint, Visio, Paint
Screen capture tool
Adobe PDF
Audiovisual media
Jabber computer-based videoconference
Videoconference
Content server video recording
Clinical software
GE Centricity Perinatal software

complementary to the topics defined in the project description and study methodology portions of this paper. The themes addressed are:

- Study assessment
- NST service implementation review
- Change management plan
- Instructional program review
- Synergy in professional roles
- Future developments

Study Assessment

Attainment of thesis equivalence objectives. When reviewing the thesis equivalence plan, it can be concluded that all listed steps are accomplished. The project has been launched and training provided at all sites, except for 8 villages in the Terres-Cries-de-la-Baie-James region. Service deployment and related instruction are planned for the next months at these sites.

Relevance of study design. The telehealth NST project is the first of its kind in this province's healthcare system. As an innovative and unique service, it is appropriate to study its development within a qualitative research approach.

Ethnography specifically has the potential of studying complex issues such as those impacting the nature of care delivery (Savage, 2006). Focused ethnographies in community-oriented health services can rapidly appraise program development (Muecke, 1993). They can assist in the change process by providing information on programme evaluation. (Savage, 2006).

The strategy chosen to govern this study corresponds to the focused ethnography characteristics described by Knoblauch (2005). Table 8 compares Knoblauch's features with the NST service survey. The selection of focused ethnography has proved itself adequate for this research.

Table 8

Comparison of focused ethnography features described in Knoblauch (2005) and of the NST service study features

Knoblauch (2005)	NST service study
Focus on finite aspects of the researcher's own community	Focus on implementation of an obstetric service Focus on the design, development and delivery of an instructional package
Pre-existing knowledge in order to address specific issues	Pre-existing knowledge in healthcare and educational technology
Data collection concentrated to intense short periods of time	Data collection concentrated to punctual observations along project timeline
Data collection performed collectively	Data collected by technological, information technology and clinical team members
Data analysis supported by audiovisual technologies	Data analysis supported by authoring software and video recording
Data analysis records structures and patterns of interaction	Data analysis records implementation, learning and change processes

Validation of findings. As qualitative research is interpretive in nature, it is important to validate the accuracy of the researcher's interpretation of the results (Creswell, 2012). Triangulation of data was achieved by obtaining data from evaluation questionnaires and through verbal exchanges with learners during and after the training sessions. Member checking was performed with clinicians, partner site managers and telehealth managers by reviewing and verifying the exactness of the themes and sub-themes.

Being the only researcher performing the study and analyzing the resulting data, interpretation is coloured by my own perspective. Having practiced nursing in obstetrics for over 15 years in a tertiary care university hospital, I recognize being less familiar with the organization of obstetric care in smaller health establishments. In contrast, the 4 years spent as telehealth clinical coordinator have widened my knowledge of the reality of healthcare in partner regions. Both clinical experiences are at play in my analysis of obtained data. My new knowledge in instructional design assists in the evaluation of the educational portion of the outcomes. These facets of my professional life could taint the validity of data analysis despite my commitment to being objective during the investigation (Knoblauch, 2005).

Outcomes of research objectives. One main objective, accompanied by several sub-objectives, was defined at the onset of this research. Throughout this document, inquiries into all of the research objectives are presented in their respective sections. Comparison to existing literature and personal reflections on these responses and discoveries are presented subsequently in this discussion.

NST Service Implementation Review

Project organizational model. At onset of projects, the telehealth team strives to consider the 7 telehealth implementation key factors identified by Joseph et al., 2011 (Figure 24). These 7 elements are discussed item per item.

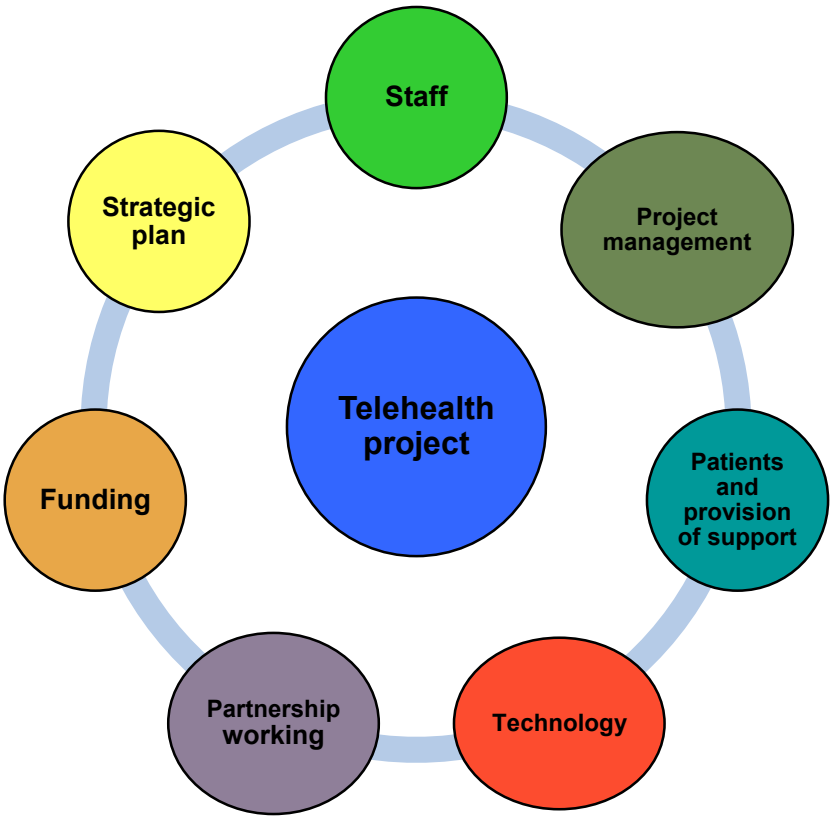

Figure 24. Seven key elements of telehealth project implementation. Adapted from Joseph et al., 2011.

When the project's scope was widened to include additional sites, a telehealth planning agent took on the clinical organizational aspects while the clinical coordinator concentrated on the educational tasks. As the complexity of project

coordination had greatly increased at this point, a telehealth project leader was allocated for the deployment phase.

Staff. Major challenges for the staff key factor are high and rapid turnover of personnel and stakeholder absence due to various leaves (sick, maternity, and vacation). The new collaborators in the replacement positions needed to be familiarized with the project, its current status and remaining efforts. Although the overall 4-year timeline of the project was not greatly affected, the accomplishment of certain tasks did take longer than expected.

Project management. The NST project evolved in compliance with the clinical service development process delineated in Figure 10. A consistent project management approach allows to fragment work into subsets to facilitate overall management, planning and control (Project Management Institute, 2008). Figure 25 represents the structure of these subsets within a project phase. This framework was independently followed in the organization of both the feasibility test and the service deployment phases of the NST project.

Joseph et al. (2011) further specify the components of these processes applied to the development and implementation of telehealth operations as:

- Issues, needs and partners identification
- Strategy production
- Funding approval
- Service delivery change implementation
- Monitoring and evaluation

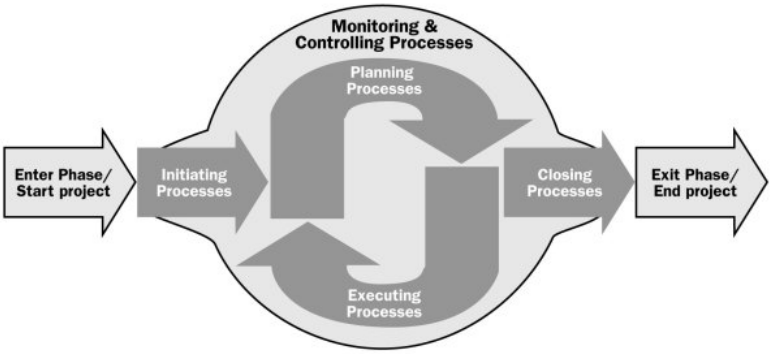

Figure 25. Sequence of processes within a project phase. Adapted from Project Management Institute, 2008, *A Guide to the Project Management Body of Knowledge (PMBOK Guide)*.

- Leadership and training

Patients and provision of support. Eligibility of patients is pre-defined by their obstetric condition. Candidates are future mothers with high risk pregnancies. Estimated volume of non stress tests fluctuates in each region. The 2 establishments in the Nord-du-Québec region usually follow 2-3 pregnancies/year and expect low frequency of service use. The Val-d'Or hospital follows a Cree clientèle with an 85 % high risk pregnancy rate and plans to receive 4-5 NSTs per week.

Technology. The selected software has been presented in the Centricity Perinatal section of the Attributes of the obstetric clinical software chapter. The quality of the NST tracing transmission was evaluated to be as adequate for clinical interpretation as the paper output produced directly from the electronic fetal monitor.

During the feasibility test phase, clinicians reported the navigation to be non-intuitive and confusing in the Centricity Perinatal system. The Centricity Perinatal application

at the MUHC was designed to be used in a birthing centre in-patient unit with continuous fetal monitoring of labouring patients and all-electronic clinical documentation. It contains numerous recording fields for activities and interventions occurring during labour and delivery.

Many of these data requests are non-relevant to the NST service. The telehealth project uses a specific selection of application windows and fields within the MUHC's version of the software. In one case study analysis performed by Rivard et al. (2011), changes to a clinical information system to more closely reflect user values facilitated the implementation process. Customization efforts for telehealth use were performed with the support of the MUCH Centricity Perinatal administrator and GE Healthcare resources. A simplified version of Centricity Perinatal was produced. Figure 26 shows the adapted telehealth virtual unit page. Figure 27 represents the NST data entry page of the telehealth version of the application. Learners who received instruction with the MUHC format provided positive feedback on the software personalization for the telehealth NST service.

Partnership working. Clinical ententes have been drawn up between the establishments of each specific service corridor. Winneway, being under Health Canada's jurisdiction, and not under the MSSS, is in a holding pattern until the legal agreements are reviewed and approved by their managers.

Bed Id	PT Name	PT Id	AttendDoc
Telesante.Val-dOr			
Telesante.Chisasibi	TEST, Test	TEST12	Dr Obs
Telesante.Waskaganish			
Telesante.Wemindji			
Telesante.Whapmagoostui	hhh	111	
Telesante.Eastmain			
Telesante.Waswanipi			
Telesante.Nemaska			
Telesante.Mistissini			
Telesante.Ouje-Bougou...			
Telesante.Chibougamau			
Telesante.Available			
Telesante.Rouyn			
Telesante.Ville Marie	SMITH, JOHN	test999	
Telesante.Winneway			
Telesante.Amos			
Telesante.Matagami			
Telesante.Lebel			

Figure 26. Telehealth virtual unit in the Centricity Perinatal software.

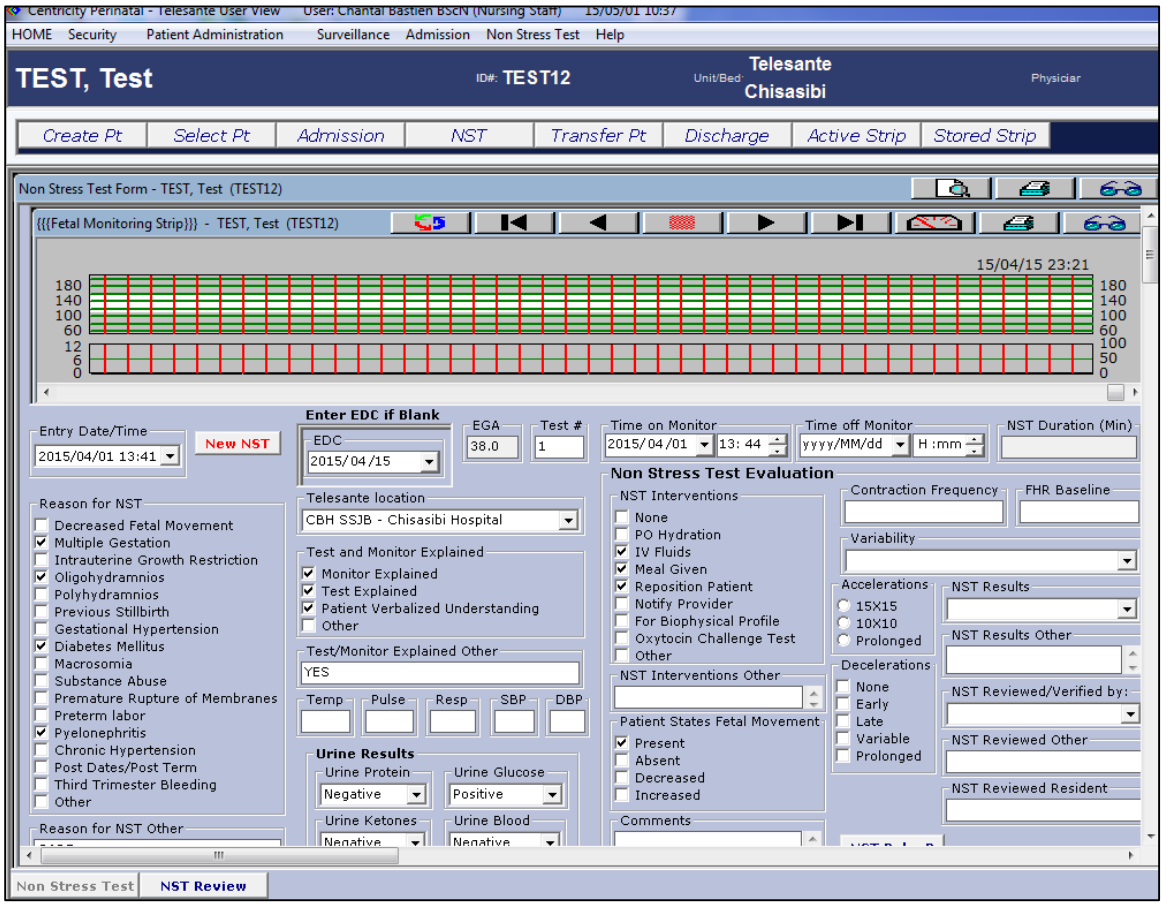

Figure 27. Telehealth NST data entry page in the Centricity Perinatal software.

Funding. The original RUIS McGill telehealth Manuel d'organisation de projet (Télésanté RUIS McGill, 2006) called for teleconsultations in obstetrics. The NST service being an addition to the approved telehealth activities, the telehealth department presented a request for change to the MSSS in order to secure funding for the project. The extra budget was necessary to secure resources, equipment, and licences. Initial implementation costs were covered by the telehealth department. Recurrence costs to be assumed by the partner sites were clearly explained to each site's top management prior to signature of the agreements.

Strategic plan. The NST project started off on strong bases with the engagement of the MUHC to share its obstetric clinical information system with its regional partners. Interested sites were informed early on of the current duration of the GE Healthcare-MUCH contract for the use of Centricity Perinatal. Cost involvement of the partner sites was clearly presented and agreed upon before service deployment. The goal was to be open about project details in order for potential partners to be well aware of the affordances and limitations of the project. This strategy supports the findings of Al-Qirim (2007) that relative advantage and cost effectiveness were the main factors influencing adoption decision.

Objectivity regarding solution pertinence was instated upon initiation of the venture by searching for an array of possible technological approaches to the identified clinical need. As in all telehealth projects, the aim of this exercise was to base the workflow on the simplest, most efficient and most cost-effective option. Research to identify existing similar services revealed that our project was first of its kind in Québec.

The possibility of capturing an NST tracing directly from an electronic fetal monitor and sending it via our standard electronic clinical request platform was researched, but proved impossible. Three obstetric clinical applications had been studied by the MUHC to answer its need of an electronic obstetric patient record. Pros and cons of these softwares were evaluated by the telehealth department. The best option responding to the main clinical objective of ensuring optimal obstetric follow-up, to avoid maternal and/or fetal complications leading to hospitalization and/or the need for premature delivery, is the implementation of the Centricity Perinatal solution to the regional partner sites.

Current project status. Nine sites are deployed and ready to electronically send and/or receive NSTs. Their actual usage of the service is infrequent and minimal as expected. Nativity rates can be as low as 2-3 births/year in certain establishments, thus the incidence of a high risk pregnancy requiring an NST is even smaller.

Other than Winneway, there now remains 8 Cree communities that will launch the NST service in fall 2015. The mobile clinical carts for the NST service have been received in February 2015. The local IT team is currently setting up the required network and port configurations in the identified clinical areas of each of the nursing stations. The delivery format of the training program might be modified for the remaining Cree communities. As the nurses of the Chisasibi hospital have received the training in October 2014, one of these nurses might be chosen to provide training to her colleagues of the remaining establishments. The second option is to replicate the teaching format and media used in fall 2014 with the clinical coordinator.

Project evaluation. Technological requirements represented the most time-consuming portion of the project. The authorization to setup a multicast network between the MUHC and each project establishment proved itself a period that lasted several months. Dependent tasks had to be placed on hold. Overall project completion was delayed by this lengthy process. The firm deadline for project deployment set by the MSSS remained at March 31st 2015. With task progression limited by each partner's respective workload and schedule, planning was tightly controlled to ensure service readiness in time.

At this period in time, the service is young. It is not possible to determine whether the anticipated clinical benefits will reveal themselves to be valid. It is also too early to determine the efficacy of the change management strategies chosen to integrate asynchronous NST interpretation into routine obstetric care in the partner establishments.

Impact on telehealth department. A literature review on the topic of telemedicine clinical service deployment from the perspective of the telehealth department produced no results. This is not surprising as telehealth is a new discipline and most research on the subject concentrates on patient and clinician impacts.

The McGill RUIS telehealth department's philosophy has always been to provide support to users on the organizational, technological, and clinical workflow aspects of their e-health activities. The specific telehealth service presented here is the first to introduce a shift in the type of support given to our partners.

Since the start-up of the CvSSS, assistance has rested solely on the telehealth department for requests on equipment, software and services owned and managed by itself. The NST service opens a new dimension by introducing shared responsibility of its support offer by the MUHC and telehealth. As the MUHC Centricity Perinatal system is owned by its Obstetric department and shared to regional partners in the context of a telehealth service, determination of each group's role in aiding its users was mandatory to eliminate doubling or gaps in service coverage.

Studies of success factors for telehealth adoption identify comprehensive support of applications and user needs as essential elements promoting project acceptance (Moehr et al., 2006 and Royal College of Nursing, 2012). Collaborative decision-making identified telehealth as first-line respondent and the MUHC Centricity Perinatal administrator as responsible for more complex issues.

Telehealth technicians are required to provide network and IT support on the software. Training materials were developed and delivered to the CECoT event coordinators and technicians on the organizational and clinical aspects of the NST service to improve their understanding of its significance. Additional instruction was given by the MUHC IT department on network and IT characteristics.

Access to Centricity Perinatal was essential for me as the clinical coordinator for my educational and clinical support functions. Thus logic dictated I be first respondent to provide support on user login and navigation demands.

The MUHC Centricity Perinatal administrator is consulted on more sensitive inquiries pertaining to programming, network extension and software maintenance.

As this distribution of responsibility is innovative, frequent concertation between the 3 groups of resources to appropriately and rapidly respond to stakeholder expectations is still necessary. Until the service is fully operational, the clinical coordinator remains the first respondent and communicates issues to the appropriate resource.

Sharing of MUHC-owned software technologies with distantly-located clinical partners is currently occurring in other health specialties. Lessons learned through the support plan of the NST service are valuable for their application and adaptation to the new similar telehealth collaborative projects.

Change Management Plan

General strategies. The change approach of the telehealth department is to understand each establishment's current situation and orientation, determine the relationship between the establishments, identify the optimal solution to implement a new service, while minimizing impact on existing work practices and relations.

Systems thinking considers a system as a global whole as well as an infinite number of smaller wholes, all linked together through patterns and relationships (Beerel, 2009). The organization is regarded at the organizational, group, and individual levels in order to understand its current dynamics and appreciate the level of adaptation required to adopt the change. The NST service sites were studied as

individual, unit, healthcare establishment, regional, inter-regional, MUHC health network and provincial systems.

Change is a natural occurrence, and an organization's position on the change–continuity continuum defines its ability to explore and exploit change (Graetz and Smith, 2010). Change and continuity compete and complement each other, as change's novelty challenges the validity of continuity's routines. Adaptation to change requires 3 trying human tasks: deciding what to keep from past practices, deciding what to discard from past practices and inventing new practices with the best past practices (Heifetz et al., 2009). Conscious of the overall uniformity of tasks mandated by the use of the Centricity Perinatal system, the clinical workflow was fine-tuned with each local team to most smoothly adapt to their reality and best manage their new duties related to the NST service.

Brunton and Matheny (2009) discuss the concept of divergent acceptance where the change objective is accepted by an organization's sub-groups, with variance in their respective interpretation of the need, thus resulting in differing enactment of the change goals. The NST service partners can be sorted into several sub-groups, each accepting to join in the project with their own views of the concomitant change and its benefits and hindrances. Project participants can be distinguished in regards to respective work responsibilities, requestor-provider telehealth roles and differing regional individualities. Change strategies considered this variability in realities by adapting strategic, technological, clinical and educational tasks to the specific actualities of sub-groups.

Individuals derive part of their identity from their work role (Cutcher, 2009). Work redesign can threaten a person's self-perception and create resistance to change. Change leadership must recognize the personal nature of organizational change and understand its perceived impact (Grenuk, 2011). Regular meetings with managers, obstetricians, and nurses were planned throughout the duration of the project to address issues, validate perceptions, create trust and diminish resistance. Some persons naturally were more pro-active in welcoming and setting up the project. These supporters became change leaders in their establishment. Adoption is facilitated when change is not only coming from without, but also from within (Grenuk, 2011).

Telehealth readiness. Telehealth adoption promotion targets specific measures at both the governmental and local levels. In order to institute high-level telehealth policies, the MSSS is reflecting on how to implement telehealth governance and standards in Québec. Inforoute Santé du Canada's report on telehealth activities across Canada identified several success factors required to maintain the expansion of telehealth and its model of healthcare delivery (Inforoute Santé du Canada. (2011, May 30). These concepts are:

- Clinician reimbursement, by the implementation of a transparent model geared to health establishments, physicians and clinicians providing healthcare services
- Professional development, by the establishment of new roles with education, training and support to develop new competencies

- Technology implementation, by the implementation of an infrastructure interoperable with provincial and physician electronic patient records
- Resolution of licence and policies/procedures issues, by the facilitation of authorization, authentification, confidentiality, security and consent processes
- Governance and policy, by the establishment of clear and transparent guidelines for telehealth investment priorities, the set-up of service and care model sequences and the coordination of supply and demand
- Change and adoption management, by the design of well-constructed workflows and processes to be effectively transposed on a large scale and to the general public
- Development and evaluation of advantages, by the clear presentation over time of the relative added value and optimization activities to participant groups
- Assistance for implementation and transition to the general public, by the operationalization of existing projects, the expansion of technical infrastructure and the support of the ongoing motion toward telehealth for healthcare delivery

The telehealth team took care to provide for all but the last of these concepts to favour institutional, unit and individual level service adoption.

At the local health establishment level, telehealth adoption measures become specific and operational. To allow innovation to occur within its structure, an organization needs to be ready for change. Weiner (2009) developed an interesting theory where organizational readiness for change is a multi-level, multi-faceted

construct. Figure 28 proposes determinants and outcomes surrounding organizational readiness for change. A standard policy of the telehealth department is to initially learn about an establishment's culture, goals, experience, needs and resources. In the course of the NST project these variables were identified for each site and the team adjusted workflow and resources to fit local standing.

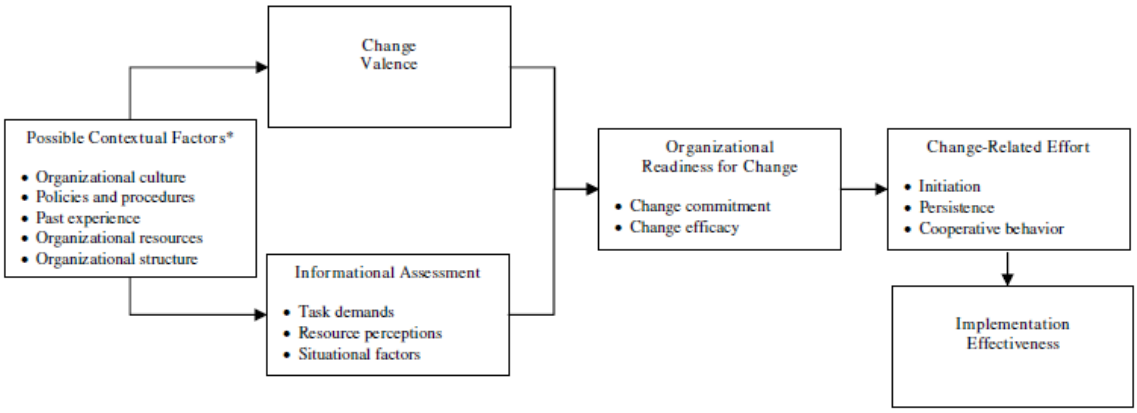

Figure 28. Proposed theoretical model of organizational change readiness. Adapted from Weiner, 2009.

Readiness for change is an overall preceding condition for the successful adoption of innovation (Jennett et al., 2005). Assessing a health institution's readiness for change conserves time, money and energy by identifying establishments apt to implement telehealth services. Jennett et al.'s (2005) literature review of telehealth readiness models exposed 3 common themes as facilitators of adoption:

- Comprehension of the benefits and risks introduced to the clinical practice context by the telehealth project

- Strong leadership from change agents professionally invested in the promotion of the telehealth project and active in developing awareness and education in their organization
- Perception that the telehealth project will respond to a specific need by increasing the efficiency and effectiveness of clinical practice

Telehealth readiness assessment tools have been developed to evaluate the potential adoption of a telemedicine project. Several researchers have examined these tools and the context of their creation and application (Légaré et al. (2010b) and Légaré et al. (2010a). Only one tool is applicable to all telehealth projects and addresses the readiness of 3 involved groups: organizational staff, clinicians and patients. At the time of this study, the reliability and validity of this tool required demonstration. The objective assessment of an establishment's telehealth readiness would be of great value to the telehealth team (Gagnon et al., 2006). Site selection, order of service implementation, facilitation and support of the telehealth project could be optimized to maximize service success.

Gagnon et al. (2006) have drawn a list of the essential conditions for successful telehealth service implementation. Table 9 presents these key factors according to their respective dimensions. A questionnaire based on identified telehealth adoption success criteria is being developed by the telehealth team. Its aim is to guide potential telehealth service sites to reflect on the administrative, technological and clinical requisites. Early knowledge of the adoption process favours appropriate change management planning and supports implementation success (Whelan-Berry & Somerville, 2010).

Table 9

Dimension effort with corresponding conditions for telehealth implementation as presented in Gagnon et al. (2006)

Dimension	Condition
Individual	Perception of easy use Integration of technology into daily practice Motivation of healthcare professionals
Professional	Adequate remuneration for professionals Definition of clear rules for professional liability Participation of physicians in decision-making
Organizational	Resources dedicated to telehealth Specific scheduling of telehealth consultations Respect of existing collaboration networks Up-to-date equipment
Socio-political/ Systemic	Investments in technologies and infrastructures Regional agreements and healthcare delivery plans based on local expertise, outreach services, and access to specialists through telehealth services
Technological	Reliable and mobile user-friendly systems Images of diagnostic quality
Ethical/Legal	Data confidentiality

The telehealth team strived to facilitate these conditions during the NST service setup by:

- Coordinating planning and update meetings with organizational stakeholders, IT network specialists and involved clinicians
- Creating clinical workflows adhering to local clinical vision and policies
- Providing training and support activities
- Providing best-fit technological equipment and IT software
- Respecting legal and ethical requirements for telehealth activities

Information technology adoption. Buckeridge and Goel (2001) defined health informatics as the scientific field dealing with the storage, retrieval and optimal use of biomedical information, data and knowledge for problem-solving and decision-making. Its goal is to improve efficiency and effectiveness within the healthcare system. As the major innovation of the NST service in all participating communities is the implementation of a health informatics system, IT adoption measures were an important portion of the change management strategy.

A literature review on IT implementation in healthcare settings conducted by Paré (2002) found over 30% of projects failed, with systems underused, not used or failing to meet their potential. Analyzing the NST project according to the risk analysis framework selected by Sicotte and Paré (2010) exhibits the sensitive areas on which to target change management measures.

- High technological risk: the complexity of the solution's hardware (laptop and electronic fetal monitor) and software (clinical information system) requirements are compounded by the need of a network infrastructure (multicast)
- Low human risk: the corresponding requestor–provider teams of users have already developed collaborative workflows and clinical procedures according to their respective service corridors
- High usability risk: the clinicians' evaluation of the effort required to redesign current information sharing processes in order to integrate the new system affects project buy-in and acceptance

- High managerial risk: the planning and scheduling of logistics, training and service launch at 18 interconnected sites is a highly complex task
- Low political risk: the project received approbation of the MSSS prior to its initiation

Successful clinical information program implementation calls for a proactive approach, anticipating and quickly resolving issues to manage risks (Sicotte et al., 2010). Throughout the NST project, ongoing evaluation of the situation with all partners and all sites was conducted, to rapidly manage and dispel actual and potential issues in order to optimize the integration of the Centricity Perinatal software into routine practice.

Psychological ownership leads to acceptance or rejection of change (Paré et al., 2006). Ownership of a health informatics solution is promoted through active user involvement and participation during the implementation process. The following approaches enhance change appropriation:

- Demonstrating the clinical utility of the clinical information system
- Encouraging a positive attitude toward use of the clinical information system
- Providing opportunities for users to discuss their needs and concerns related to the clinical information system, as well as its impact on work activities

Clinicians' usage and adoption of health informatics projects are influenced by individual beliefs about information technology (Paré et al., 2006) and by perceptions of organizational readiness for clinical IT-based change (Paré et al., 2011). Paré et al. (2011) present a research model tying identified properties to

opinions of change readiness. Figure 29 presents the 5 categories of variables affecting perceptions of readiness of one's organization to integrate an IT program. Their study revealed the factors most associated with perceptions are vision clarity, change appropriateness, change efficacy, presence of an effective champion, collective self-efficacy and organizational flexibility.

A systems approach linking information technology adoption by users with organizational fit and performance, as recommended by Raymond et al. (1995), was selected to favour its integration into the workplace. Concretely, the change management plan translated itself into the following activities geared to reducing resistance to change while enforcing adoption:

- Clear, targeted and adapted communications of project goal, affordances and tasks to each project site participants
- Weekly telehealth team meetings to inform all members of project status and current tasks
- Regular contact of telehealth team members with the various stakeholders (GE Healthcare, MUHC and partner site organizational managers, clinical and administrative staff, regional and local IT and network specialists)
- Flexible management for adaptation of the project to individual partner site needs and realities
- Monthly e-bulletins informing all stakeholders of project status and upcoming tasks
- Consultation and involvement of stakeholders for joint decision-making and implementation

Change attributes

- Vision clarity
- Change appropriateness
- Change efficacy

Leadership support

- Top-management support
- Presence of an effective champion

Organizational context

- Organizational history of change
- Absence of organizational conflicts
- Organizational flexibility

Change targets' attributes

- Collective self-efficacy

Figure 29. Variables influencing clinicians' perception of organizational readiness to adopt IT-based change. Adapted from Paré et al., 2011.

- Identification of project promotion champions at each site
- Personalization of the Centricity Perinatal software to the telehealth project needs
- Personalization of instruction for each role
- Documentation of procedures

Instructional Program Review

The very nature of telehealth projects implies implementation of innovation, change and technology at proximal and distally-located sites. Change and technology initiatives require staff development. As presented above, successful change management initiatives arise from organizational readiness and institutional

leadership engagement (Gagnon et al., 2005). Learning activities in identical fashion benefit from leadership support (Tynan et al., 2012).

Change-related training is a driver that is strongly linked with employee adoption of the change initiative, which in turn leads to successful organizational change adoption (Whelan-Berry & Somerville, 2010). One of the major change management initiatives in the NST project is the design, development and delivery of the training program and materials defining the specific actions and processes involved in the execution of the telehealth service. The need for education in health informatics was clearly identified to acquire essential skills and knowledge to appropriately interact with the technology (Buckeridge and Goel (2001). Given the differing clinical contexts of NST service sites, the plurality of roles of clinicians, the challenge of adopting an obstetric IT software and the still novel nature of telehealth activities, the instructional program becomes an important foundation for workflow and individual task appropriation.

Design and development of learning materials. The training materials for the NST service consist of three distinct modules: a training manual on the Centricity Perinatal software, an informative document on the setup of the electronic fetal monitor for use with the Centricity Perinatal software and a practical guide on the NST service for the telehealth technicians. Table 10 presents an overview of the educational content of each module.

It is of importance to note that the telehealth team's purpose is to provide instruction on telehealth tools, protocols and procedures. The teaching of essentially clinical

Table 10

Overview of the educational content of the 3 training modules of the NST service

Module	Content
Centricity Perinatal training manual	Presentation of NST service goals and workflow
	Summary of data structure within Centricity Perinatal
	Detailed presentation of navigation and required tasks for requestor sites
	Detailed presentation of navigation and required tasks for providing sites
Electronic fetal monitor set-up for Centricity Perinatal	Presentation of configuration parameters for Centricity Perinatal coordination
Practical guide for telehealth staff	Presentation of NST service goals and workflow
	Overview of navigation tasks at telehealth sites
	Overview of continuity plan

tasks and activities such as placing a pregnant patient on the electronic fetal monitor for an NST test, learning basic NST interpretation skills and responding to urgent cases remain the responsibility of each specific health corridor provider sites.

Several other supporting and organizational documents were produced to fully respond to the stated clinical learning objectives of the project.

- A clinical guide assembling all pertinent NST service information (generic workflow, service offer, clinical NST protocol, NST clinical decision tree, NST tracing and report archiving policy)
- A translation guide of the relevant telehealth screens as the Centricity Perinatal software is available only in English

- A clinical workflow personalized for each site according to the service corridor
- A continuity plan in the event of telehealth service interruption
- A new site addition request procedure

ADDIE-M model. The ADDIE model seemed an appropriate instructional design model to create required learning content and training materials for the project (Carliner, 2003). The ADDIE process was thus followed to create the three learning modules.

When considering the Centricity Perinatal software training materials developed for the feasibility test as a prototype of the instructional package, the actual instructional design employed for this specific module was the ADDIE-M model (Schoenfeld and Berge, 2004). Formative evaluation by the feasibility test clinicians during the design and development phases brought on improved versions of the course. The added maintenance phase of the ADDIE-M model has become an integrated component of the planned NST service support activities.

Table 11 summarizes the steps of the ADDIE and ADDIE-M models.

Table 11

Specific actions taken during the creation of the 3 NST service training modules according to the ADDIE and ADDIE-M instructional design models

Steps	Actions
Analysis	Comprehension of the project's clinical objective
	Identification of current knowledge status and intended role for each stakeholder group
	Identification of learning needs
	Definition of learning objectives
	Definition of evaluation criteria

Table 11

Specific actions taken during the creation of the 3 NST service training modules according to the ADDIE and ADDIE-M instructional design models

Steps	Actions
Design	Tailoring of module structure to new telehealth clinical workflow tasks
	Selection of videoconferencing as instructional medium
Development	Use of PowerPoint as authoring tool
	Identification of clinical coordinator as instructor
	Technical review of content by the MUHC Centricity Perinatal administrator
	Pilot-testing performed by a telehealth clinical colleague
	Production review by the chief project manager
	Minor adjustments to content
Implementation	Scheduling of training sessions
	Enrolment of learners
	Distribution of learning materials by e-mail
	Delivery of training modules
	Video recording of a training session of the Centricity Perinatal module
	Video recording of the training session for the telehealth technicians
Evaluation	Analysis of learning satisfaction evaluations
	Ongoing post-training support
	Scheduling of repeat training sessions (prior to service deployment)
Maintenance	Project management coordination activities
	Personalization of the Centricity Perinatal software for the telehealth service
	Cyclic updating of course materials
	Documentation of activities for future deployment reproducibility

Constructivist instructional strategy for adult learners. Instructional materials are developed from a constructivist standpoint. Constructivism is a sum of approaches, combining elements of the learning theories of Piaget's cognitive and developmental perspective, of Bruner's and Vygotsky's interactional and cultural emphases, as well as the evolutionary and biological contexts of learning (Driscoll, 2005). Learners are actively constructing knowledge to create their own individual representation of the world, further validating their understanding through social interactions with other learners and teachers.

Problem-solving, reasoning, critical thinking and reflection are the goals of constructivist learning. Favourable learning conditions are:

- Relevant and complex learning environments: complex learning environments consist of both tools and content for learners to challenge their existing models and encourage them to create better alternative models
- Social negotiation: learning environments foster social interaction and collaboration to synergistically build insights and solutions
- Multiple perspectives and modes of learning: ill-structured content domains require complex, irregular and diverse learning strategies
- Ownership in learning: learners actively decide what, when and how to learn
- Self-awareness of knowledge construction: learners are aware of their role in knowledge construction (Driscoll, 2005)

Constructivism is well-suited to adult learners. Knowles (1973) presents 4 assumptions of andragogy that align well with these constructivist provisions. Knowles added a fifth assumption in 1984 (Pappas, 2013).

- Changes in self-concept: as a person matures, one's self-concept evolves from complete dependency to one's own self-direction
- Role of experience: as a person matures, one accumulates a pool of experiences which become a rich learning resource and serve as a wide base onto which one can anchor new learnings
- Readiness to learn: as a person matures, one's readiness to learn decreasingly results of biological and academic impulses and increasingly grows of developmental responsibilities of one's social roles
- Orientation to learning: as a person matures, one's time perspective changes from one of postponed application to immediacy of application, resulting in a transition from a subject-centered to a problem-centered approach to learning
- Motivation: as a person matures, one's motivation to learn becomes internal

Pappas (2013) discusses Knowles' 4 principles of adult learning and further explains their application to the design of e-learning experiences (Pappas, 2014).

- Adults need to be involved in the design and development of their learning experience. Adult learners must be a part of the development, implementation and evaluation of the instructional program in order to design learning materials and activities in alignment with their needs.

- Experience is the basis of the learning activities. Adult learners engage in the new tasks to explore through trial and error to reach meaningful learning.
- Adults are interested in learning with immediate relevance to their personal and professional lives. Adult learners' interest in learning is stronger when the goals are tied to real world benefits and applications.
- Adult learning is problem-oriented. Adults absorb knowledge by practical application of new material through simulation, repetition, experience and skills fine-tuning.

The NST service learning requirements fit well with these constructivist and adult learning principles. Healthcare personnel regularly engage in constructivist collaborative multidisciplinary activities to learn and integrate improved patient care strategies. As adult learners, the clinicians understand the objectives and changes in patient management and work routine caused by the integration of the new service. Navigation in the NST clinical application requires complex steps that vary in nature and sequence according to one's telehealth role. NST service self-instruction activities were organized as both individual and group activities to allow self-integration as well as group discussion and learning.

Construction of educational content. Ruey (2010) integrated these concepts of constructivism, andragogy assumptions and adult learning principles into a model to facilitate online constructivist-based adult learning (Figure 30). Although the NST course was offered through videoconferencing, the principles of the model apply to the design of the course.

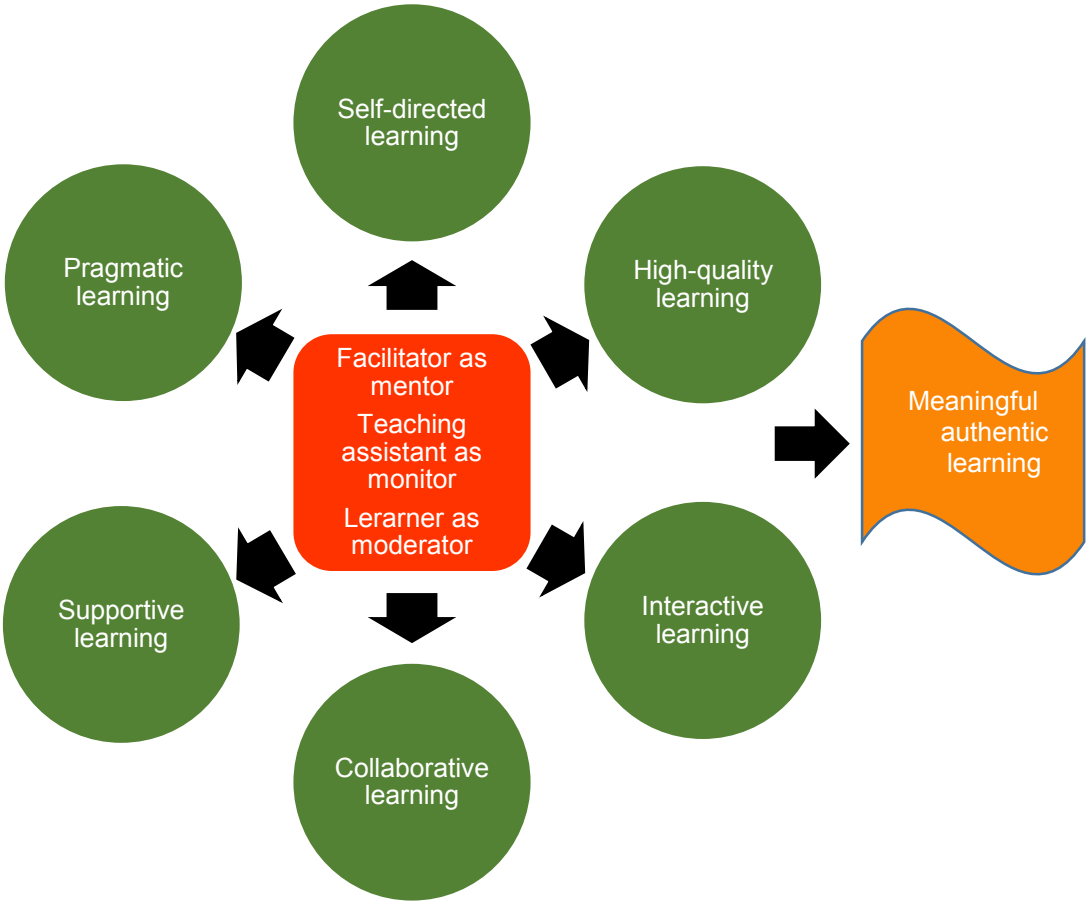

Figure 30. Instructional design model facilitating online constructivist-based adult learning. Adapted from Ruey, 2010.

Specifically, deliverables were produced in respect of these precepts by engaging learners' interest, participation and feedback by frequent expression of adult learner constructivist tenets:

- Formative evaluation of the feasibility test learning materials by the learners to gather their comments and suggestions to optimize the NST service instructional package construction
- Clear presentation of the goals of the NST service to the learners to foster understanding of the need for change in their clinical practice
- Clear presentation of the goals of the NST educational program at the onset of instruction to relate learning tasks to clinical activities
- Clear presentation of the software's affordances to focus on the contribution of technology implementation to the efficiency and effectiveness of patient care
- Inclusion of both requestor and provider centre roles in the instructional material to foster understanding of each site's responsibilities and collaboration in the change effort
- Live group instruction to foster learner-instructor and learner-learner communication and exchanges
- Instructional documentation conceived as support material for self-led and group hands-on learning activities
- Summative evaluation of learning program, instructor and training delivery mode by learners to collect information for relevant future adaptation of the instructional package

- Ongoing, rapid and active support to learners to respond to their immediate professional needs during practice runs and initial telehealth NST activities

Delivery of instructional program. Communication technologies are a daily practice in our work environment. Distance education is a routine solution for the provision of required training.

Distance education. Distance learning is structured learning taking place without the physical presence of instruction (Holden et al., 2010). It requires physical distance between the learner and the instructor, content provided by an organization, objectives in a structured curriculum and measurement of learning. Distance education can encompass several media types, such as the videoconferencing, video and print media used in the NST service training, to serve different instructional objectives (Bernard et al., 2004). The conclusions of the meta-analysis applied to the NST program are:

- Attention to the quality of the course design should transcend attention to media characteristics
- Opportunities for communication foster better attitude and achievement outcomes in both synchronous and asynchronous distance education
- Supplementary materials such as video and computer-aided instruction promote better attitude and achievement in both synchronous and asynchronous distance education
- Interactivity-supporting media such as telephone and computer mediated communication foster better attitude in asynchronous distance education

Holden et al. (2010) corroborate by suggesting specific instructional media support suited to educational needs and learning conditions. Table 12 presents the

Table 12

Affordances and weaknesses of the instructional media selected for the NST service training package. Adapted from Holden et al. (2010).

Instructional media	Affordances	Weaknesses
Videoconferencing	Instructor can view the learners at remote sites	Access issues if videoconferencing equipment is unavailable or incompatible
	Students can demonstrate a procedure	Signal delay might produce audio and/or video latency
	High interaction with immediate feedback	
	Instructors can share their screen and applications	
	Computer monitor allows desktop videoconferencing	
Video	Transmission of full-motion video and high-impact visuals	Production and distribution costs can be high
	Self-pacing	No instructor-learner interaction
	Continual review of content	Revisions require new recordings
Asynchronous web-based instruction	Delivery to widely dispersed audiences	Internet connection required
	Self-pacing	Computer literacy required
	Easy content updates on own server	Low bandwidths can affect content design

Table 12

Affordances and weaknesses of the instructional media selected for the NST service training package. Adapted from Holden et al. (2010).

Instructional media	Affordances	Weaknesses
	Addition of synchronous interactive technologies possible	Content design, development and updates can prove costly
Print	Anytime anyplace learning	Limited instructional strategies
	Multimedia can enhance materials	Logistical infrastructure to produce and distribute materials
	Accessible without technology	Updates require reproducing materials
	Inexpensive	

affordances and weaknesses of the instructional media selected for the training program.

Table 13 displays the instructional strategies used in the NST service program and their corresponding media.

Table 13

NST service instructional delivery media and their corresponding instructional strategies and materials. Adapted from Holden et al. (2010).

Instructional media	Instructional strategies
Videoconferencing	Narration/Description - Lecture
	Demonstration
Video	Narration/Description - Lecture
	Demonstration
Asynchronous web-based instruction	Narration/Description - Lecture

Table 13

NST service instructional delivery media and their corresponding instructional strategies and materials. Adapted from Holden et al. (2010).

Instructional media	Instructional strategies
	Demonstration
Print	Narration/Description - Lecture

Development of the NST training program strived to follow these recommendations. Content was created first to meet the identified learning needs. Instructional media was then selected to best fit with the context, the location of the learners and the available technology. Learner-instructor communication was encouraged during and after the videoconference session to strengthen opportunities for new knowledge retention through direct response and support during later hands-on training with the software.

Learner-learner interaction was promoted by the identification of local site champions and by fostering practical group learning sessions. Asynchronous support measures, such as a video of the training session placed on the telehealth portal and rapid response to email communications were offered to users.

Videoconference sessions were the primary media used to provide training to learners. Video lectures hold promise of improving distance learning by responding to the social aspects of the learning process (Geri, 2012). Videoconference-based learning environments for an adult population can provide ease of participation and appropriate student-instructor interaction through problem-centered instruction (Malinovski et Vasileva-Stojanovskal, 2015). Complementary instructional material

available on the telehealth portal and upon request to the CECoT completed the constructivist learning activities toolkit.

Distance educator competencies. E-teachers' main roles have been categorized by Seok (2008) into 4 pedagogical roles:

- Instructional designer
- Discourse facilitator
- Subject matter expert
- Technician

Educational technology attends to the conception and distribution of instruction within both low and high technology environments. Learning materials are developed according to instructional design principles and presented through selected media to best answer identified needs and goals. Course designers and instructors must acquire competencies as distance educators to maximise learners' knowledge acquisition experience.

Darabi et al. (2006)'s study identified the top competencies of a distance educator. Distance educators should have strong teaching, communication, interaction facilitation and course management skills. Interaction, both learner-instructor and learner-learner, remains a fundamental component of distance education and fosters optimal learner responsiveness. More precisely, a distance instructor ought to use appropriate presentation strategies, facilitate productive discussions and offer timely and informative feedback. Bernard et al. (2004) report literature calling for constructivist teaching practices from synchronous distance education

instructors. Synchronous online learning affords such a constructivist framework through highly interactive activities which solve complex problems and develop ideas and critical thinking skills (Taran, 2006).

Subject matter experts can be trained and guided by instructional designers on course design, development and delivery in synchronous teaching conditions in order to become course creators and distance educators (Taran, 2006). Combining these roles in an organization's own employees can favour more rapid course creation and more effective training strategies at a lower cost. Interaction, and experiential learning remain mandatory for the learner to attain mastery in such learning projects.

These logistical and pedagogical tasks can be adequately performed if the distance educator is experienced and comfortable with the use of the selected technology (Darabi et al., 2006). Technical aptitudes are required in both synchronous and asynchronous environments. As a synchronous distance education setting resembles classroom instruction, the adoption of new teaching methods might be more critical in asynchronous milieus (Bernard et al., 2004).

As earlier mentioned in the introduction portion of the discussion, the combined roles of educational technologist, telehealth clinical coordinator and distance instructor have heightened my abilities as content developer and teacher. Competence in software navigation and with videoconference technologies was acquired through problem-solving and hands-on practice. Adding these newly-acquired skills to existing knowledge and experience strengthened my capacity to

provide synchronous and asynchronous instruction via distance education technology.

Analysis of the instructional program. The instructional program is the last project management milestone. Once the participants were trained at each requestor and provider site dyad, the service was ready for launch. The training package is designed as a step-by-step guide for all required workflow tasks of the NST service.

Learner experience. The content of the Centricity Perinatal training package was well received in terms of clarity and usability. The sites having started their activities have performed the tasks correctly while following the learning guide. Requests for shadowing were made for the first telehealth NSTs for guidance and support.

The electronic fetal monitor document's content was also viewed as clear, but much less pertinent. This opinion is understandable when considering the context of the learners. This group trained during the first deployment phase is experienced in fetal monitoring and does not require further information on the subject. The specific parameter configuration required for the NST software is well understood by the clinicians. It is estimated this training document will be of greater value for the learners of the second deployment phase, projected for fall 2015 in the 8 remaining Cree communities. As most of these villages are not yet equipped with electronic fetal monitors, the learning material should prove more useful.

The training sessions and accompanying documents for the telehealth team were again welcomed as useful and clear. The materials achieved the goal of

familiarizing coworkers to their support role. As service usage is still low at this time, ongoing tutoring is planned to assist colleagues in this new task.

Delivery of training through synchronous media such as videoconferencing is perhaps more appropriate for higher cognitive levels (Holden et al., 2010). Analysis, synthesis and evaluation require social perspective and interaction (Anderson & Dron, 2012). Linking remote classrooms through videoconferencing allows to display learning content onscreen while maintaining visual contact with participants to facilitate exchange and discussion. The scheduling limitation of the synchronous training method is compensated by the asynchronous availability of the instructional package on the telehealth portal for access at the learner's convenience.

The planned instructional intervention was to provide student-content interaction during the live videoconference session, at the sites where technologically possible. The intention was that learners would listen to the instructor's presentation while simultaneously performing the navigational steps in Centricity Perinatal on their NST cart's laptop. Engaging students with the content brings about substantial positive difference in the achievement result (Bernard et al., 2009). Unfortunately, in all sites, the rooms in which the NST carts were connected to the multicast network were different than the videoconference-enabled rooms. This created an abstract and dry learning environment where the learners listened to the instructor without having the opportunity to practice. Arrangements were made for instructor support via telephone for future practical learning sessions.

Concomitant with this lack of opportunity for guided practice is the fact that in several sites an electronic or paper version of the Centricity Perinatal training document was unavailable during the instruction sessions. A strong recommendation was made to have the walk-through document available for hands-on practical exercises in order to maximise the potential of such constructivist learning activities.

Another impact, both positive and negative, to instruction is the timing of the launch of the telehealth software customization midway through the teaching calendar. The navigation in Centricity Perinatal was simplified, leading to a more intuitive usability, which was promoted during the learning periods. As the instructional documents were based on the original software version, some confusion arose as the steps included in the training package were somewhat different than those demonstrated during the live instruction sessions. A revised edition of the Centricity Perinatal manual was produced in November 2014. The software translation guide completed the educational resources for the telehealth edition of Centricity Perinatal.

The time span between the training session and the actual launch of the service represents 6 months in some of the partner sites. NST service technology and network maintenance, staff shortages and low clinical volumes all contributed to this delay in application of learning. To counter this issue, several supportive measures were set up:

- Pre-validation of electronic fetal monitor signal pickup by the Centricity Perinatal program through remote access prior to initial launch to validate

technology connectivity and optimize time management of busy clinicians' schedule

- Set up of a practice environment for telehealth users in Centricity Perinatal where learners can create test-patients and perform required tasks without contaminating the production database
- Access to all pertinent NST service documentation placed on the telehealth portal for 24/7 availability to meet the schedules of participating clinicians
- Availability of instructor for planned and spontaneous support of user access and navigation questions

While initial training was provided through formal instructor-led teaching sessions, it is expected continuing knowledge acquisition and integration into workplace activities will occur through informal learning. Group and individual activities facilitate informal learning (Carliner, 2012). In the context of the NST service, the following approaches are favoured to strengthen the newly-acquired knowledge and skills:

- Coaching relationships in which coaches provide individualized feedback and guidance to learners
- Implementation of a telehealth NST network to support participant communities through sharing of experiences
- Peer learning with coworkers interacting together to develop their skills, attitudes and knowledge
- Learner on-the-job training in the use of the practice and production environments

- Performance support through online training guides, workflows, job aids and procedures accessible on the telehealth portal
- Trial and error learning and support with as-needed and just-in-time contact with the instructor for feedback

Evaluation of the training program's impact is a crucial element in the ADDIE and ADDIE-M models. As some participating healthcare corridors need to start their telehealth NST activities, and as the second deployment sites have yet to receive training, an overall assessment of instruction can only be performed at a later date. Analysing the educational package through the lens of the 5-step modified Kirkpatrick model presented in Galloway (2005), one arrives at a partial appreciation of the learning effort.

- Level 1 – Reaction: Participants were asked to complete and return an evaluation questionnaire on content usefulness, organization, preferred topic, most and least useful elements, comments and suggestions for future training sessions and expected follow-up support
- Level 2 – Learning: Learning has been estimated through participants' subjective comments on their new knowledge; as the trainees could not return demonstrate their newly acquired skills, it was not possible during the teaching sessions to determine learning
- Level 3 – Behaviour: The instructor having access to the practice and production Centricity Perinatal environments, it is possible to measure transfer of knowledge to the workplace by distantly observing participants' ability to perform the required steps in the practice environment, and for

those sites having commenced NST activities by witnessing the correct uptake of clinical data into the production environment

- Level 4 – Results: At this moment in time, it is too early to attempt to evaluate the value of the training program in terms of organizational goals, budget, productivity and patient experience
- Level 5 – Return on investment: The NST service is still too young in lifespan and too low in activity levels to measure the credibility of the training program in terms of clinical budget savings relative to cost of instruction

Telehealth team experience. The telehealth team routinely provides synchronous and asynchronous training on its technological and clinical tools for its clientèle. New participants in the Montreal area receive mostly in-person teaching. Clients outside the metropolitan area benefit from distance education through videoconference or phone sessions.

The training for the NST service differed from these usual formats. As the Centricity Perinatal software was only available on the clinical coordinator's computer, standard self-standing videoconferencing technology was not possible. The selected computer-based videoconference technology affords the capabilities of screen sharing to display the learning materials, good audio and video quality to ensure student comprehension, adequate interface capacity with distant site standard videoconferencing equipment and is integrated on Québec's RITM system.

Prior to the NST service training, computer-based videoconferencing within the McGill telehealth network consisted mostly of real-time teleconsultation, with the providing physician's computer set up with the tool. The novelty of the computer-based videoconference activity for the NST service is its use for training via screen sharing.

This innovative application of the technology brought the telehealth team into a learning curve. Adjustments were made after the first sessions according to the constructive comments gathered from both learners and the instructor. For example, during the first 2 teaching sessions, when the instructor's desktop was shared, an inadequate image resolution was obtained on the distant sites' videoconference screens, producing an image too small to be read by the learners. Rapid investigation of the issue through trial and error by the telehealth technicians identified the optimal instructor's screen resolution to legibly share content. This problem-solving exercise was crucial to the success of further computer-based videoconference training courses as proper audio/video parameters and system performance positively influence student participation and student-teacher interaction during the learning period (Malinovski & Vasileva-Stojanovska, 2015), two important factors of constructivist learning.

To optimize both the instructor's work schedule and to maximise the learners' choice of educational periods, each session of the training calendar was opened to participants from both requesting and providing sites. Mixing learners with various NST service roles within one class is intended to favour inter-site discussion and appreciation of the administrative and clinical tasks required at the complementary

health service corridor site. Linking interprofessional education and interprofessional collaboration in such a manner enacts the concept of interprofessionality which is thought to foster collaborative and improved patient-centered practice (D'Amour & Oandasan, 2005).

As participants were registered to training sessions by their managers according to local clinical availabilities, the composition of each group varied greatly in terms of numbers and roles of learners. Class size ranged from one to thirteen persons. Some groups consisted mostly of personnel of requesting sites, others mainly of providing sites and still others of both types of sites. Depending on local clinical unit acuity at the planned instruction time, some students presented late, left early or had to reschedule their attendance. As an instructor, flexibility was mandatory to adjust the teaching focus to the needs of the group while maintaining course objectives.

The training purpose being to learn to navigate within Centricity Perinatal, the inability of learners' to simultaneously perform the tasks during the videoconference teaching format is felt to be a major setback to the efficiency of the instructional act. In retrospect, and irrespective of budgetary implications, the most appropriate instructional strategy would be in-person training at the local sites. The trainer would travel to each site and offer a classroom presentation, followed by a practical session where the learner could appropriate the software and perform the required tasks under supportive guidance.

PowerPoint and video recording were tools selected to create and distribute the instructional materials for the NST service training package. The purchase of video screen capture and e-learning authoring softwares would be beneficial to the telehealth team for learning material design and online distribution of the instructional package.

Synergy in Professional Roles

Nursing experience, telehealth clinical coordination and educational technology training produce a well-rounded and powerful combination of knowledge and skills for the author of this thesis. Every aspect of these roles interacts and builds a strong foundation to aptly analyze the identified technological and educational solutions to clinical telehealth projects.

Nurses working in telehealth require knowledge and skills in several areas (Carter et al., 2010). Aside from basic nursing education, unique competencies in other fields are suggested. Table 14 lists these clinical, technological, educational and social telehealth nursing qualifications. Achieving proficiency in these competencies is a continuous, ongoing professional development process.

Prior obstetric nursing experience at the MUHC is a major facilitator in my role of clinical coordinator and instructor for the NST project. Comprehension of the clinical impact of the proposal, prior professional relationships with key MUHC stakeholders, training on Centricity Perinatal at its time of implementation in the MUHC Birthing Centre all positively impact the organizational and clinical aspects of NST service deployment.

Table 14

Clinical, technological, educational and social telehealth nursing competencies. Adapted from Carter et al. (2010).

Competency domain	Nursing abilities
Clinical	Clinical skills
	Clinical frameworks
	Clinical theories
	Evidence-based practice
	Critical thinking
	Medico-legal requirements knowledge
Technological	Computer literacy
	Information technology proficiency
	Expansive technology knowledge
	Technological application integration into clinical practice capability
	Nursing informatics skills
	Technical and trouble-shooting skills
Educational	Expert teaching ability
Social	Counselling skills
	Communication skills
	Interpersonal skills
	Organizational skills
	Flexibility
	Acceptance of change

The telehealth clinical coordination experience generates insight into regional healthcare organization, construction of a telehealth contact network and development of solid knowledge of telehealth procedures. The refinement of skills and aptitudes in project/change management and in collaborative teamwork fosters

innovative approaches for the specific needs, requirements and solution of each telehealth project.

Teamwork is an important need in health informatics projects which enables the team as a whole to build a cohesive and coordinated solution (Mantas et al., 2010). Complementary knowledge and expertise of each key actor produces a comprehensive vision of the entire project (Sicotte et al. 2006). During the NST deployment phase, with the widened project scope and the overall increase in telehealth workload, a new team member was given the responsibility of organizing the clinical tasks of the NST service. The clinical coordinator retained the mandate for design, development and delivery of the instructional package.

Higher education in the Educational technology program is a powerful advantage for a telehealth clinical coordinator. Telehealth project planning selects optimal technologies and identifies strategies to promote clinician buy-in and utilization. Instruction on educational software and supportive technologies during the program's coursework cultivated understanding of the use of similar media options in healthcare. Project, change and performance management classes introduced concepts now used daily in my work role. Instructional design knowledge is applied to all training projects.

For the training package here discussed, the clinical coordinator held the roles of subject matter expert, instructional designer and trainer. This combination of functions brings Taran's (2006) recommendation of having an instructional designer oversee a subject matter expert to ensure content relevance to objectives, and

clarity and quality of instruction, one step further. This multipurpose position is also efficient when considering the current demands in the healthcare system to maintain care quality while reducing costs.

The NST project represents the largest training package mandate yet for the clinical coordinator. The learning curve required to produce quality deliverables demanded a considerable amount of time and effort. Managing the obligations of multiples roles required effective time management skills to continue meeting mandatory tasks during the busiest periods of instructional content development and course delivery.

Interest in health information exchange technologies grows in the pursuit of better patient safety and healthcare accessibility and efficiency (Sicotte and Paré, 2010). The telehealth team is currently involved in the deployment of several other clinical information systems to regional and provincial partners. The lessons I learned as clinical coordinator, instructional designer and instructor during the NST initiative are now applied to these upcoming projects. The resulting collection of tactics in these three roles continually expands with each new project.

Future Developments

Research developments. The NST service deployment is one of the first telehealth projects in which a clinical information system's network is extended outside of its own healthcare establishment to be shared with regional partners. This research's small number of participant sites and partial results are not sufficient to permit generalization to other similar projects. As sharing of health informatics softwares is a growing tendency in Québec's telehealth infrastructure, new comparable research projects could collate their results with those of the current study in the objective of identifying common tendencies, strategies and results.

This thesis examined change management as a determining factor in telehealth project adoption. The focused ethnography research design here featured to study the multi-site telehealth NST service could be a precursor leading to a structured quantitative research on organizational telehealth readiness for change, its determinants and outcomes, as well as implementation effectiveness.

The ADDIE and ADDIE-M instructional design models were found appropriate for the design, development and delivery of the NST service instructional package. Future research must be performed to determine if different instructional design models are also valid choices.

Clinical developments. Training for the NST project for the personnel of the Cree communities to be deployed in fall 2015 most probably will be provided locally by one of the region's nurses. Support from the telehealth clinical coordinator will be offered as usual.

The Northern regions historically have a high and rapid turnover rate of personnel. Although the details need to be determined, the clinical coordinator, a minimum of twice a year, will offer complete training sessions by synchronous distance education for new regional staff members.

Current telehealth NST numbers are low. While awaiting launch of the service, several sites are currently making use of their NST mobile cart to locally perform NSTs. Staff can maintain competence in the navigational tasks and obtain experience handling the equipment and software.

The Terres-Cries-de-la-Baie-James – Val-d'Or corridor has recently started a synchronous obstetric ultrasound and consultation telehealth service. The complementary clinical assessment of fetal well-being afforded by the NST service will enhance the distant health services offered to this clientèle.

The recent move of most of its clinical services to the MUHC's Glen site created the opportunity for the Obstetric department to benefit from the telehealth mobile solution. The new Glen Birthing Centre is equipped with mobile carts adapted from the telehealth concept.

Two of the MUHC hospitals, the Montreal General Hospital (MGH) and the Montreal Neurological Institute (MNI), are remaining in their current sites. Women's Health services, including the obstetrics department, are now offered from the Glen site. While the MGH and the MNI infrequently tend to patients requiring non stress tests, when pregnant women are admitted, access to obstetric clinical staff is mandatory. Being a Trauma centre, the MGH Emergency Department and Intensive Care Unit at times require rapid determination of fetal well-being by an obstetrician. The MNI Intensive Care Unit occasionally cares for pregnant women requiring NST follow-ups. All three units will receive a telehealth NST mobile cart to transmit electronic fetal monitoring tracings, thus reducing the impact of being physically distantly located from obstetric support.

Summary

The telehealth NST service is an innovative method of obstetric healthcare delivery in Québec. The main clinical objective has remained the focus of the project: to ensure optimal obstetric follow-up, in order to avoid maternal and/or fetal complications that could lead to hospitalization and/or the need for premature delivery. The affordances of the solution allow future mothers to remain in their community of origin to receive antenatal care.

The NST project has been a rich experience for all involved stakeholders. The technological challenge of extending the MUHC's Centricity Perinatal network to its distant partners has been met through close collaboration and shared effort of numerous partners at both local and regional levels. A new telehealth NST clinical

workflow has been designed and adapted specifically for each health service corridor. Training has been offered to administrative and clinical personnel in each site through distance education technology.

A key success factor of the project has been the cooperative alliance of telehealth, regional and local stakeholders within the three organizational, technological and clinical milieux. A thorough understanding of the respective sites' structure and organization guided the selection of efficient change management strategies. Acceptance of the telehealth service and its integration into routine clinical practice seem well underway. Due to the current partial launch status, precise evaluation of NST service adoption needs to be performed at a later date.

The instructional package produced responds adequately to the learning needs of the administrative, clinical and telehealth partners. The delivery method for the telehealth team training was an appropriate selection. The objective of the course for this group was informative in nature as the technicians do not require access to the NST service software. The synchronous videoconference instructional strategy is also effective for the informative learning needs of the regional sites' administrative and clinical trainees. As the specific technological set-up of the clinical information system was configured in clinical areas and not in videoconference rooms, the learners are unable to simultaneously practice and demonstrate their new aptitudes during course time. In-person training and telephone support are planned solutions to this situation.

The combination of clinical and educational roles for the author is a significant factor in her ability to meet her telehealth professional tasks and responsibilities. The experience gained during the course of the project is invaluable and is already applied to new telehealth projects.

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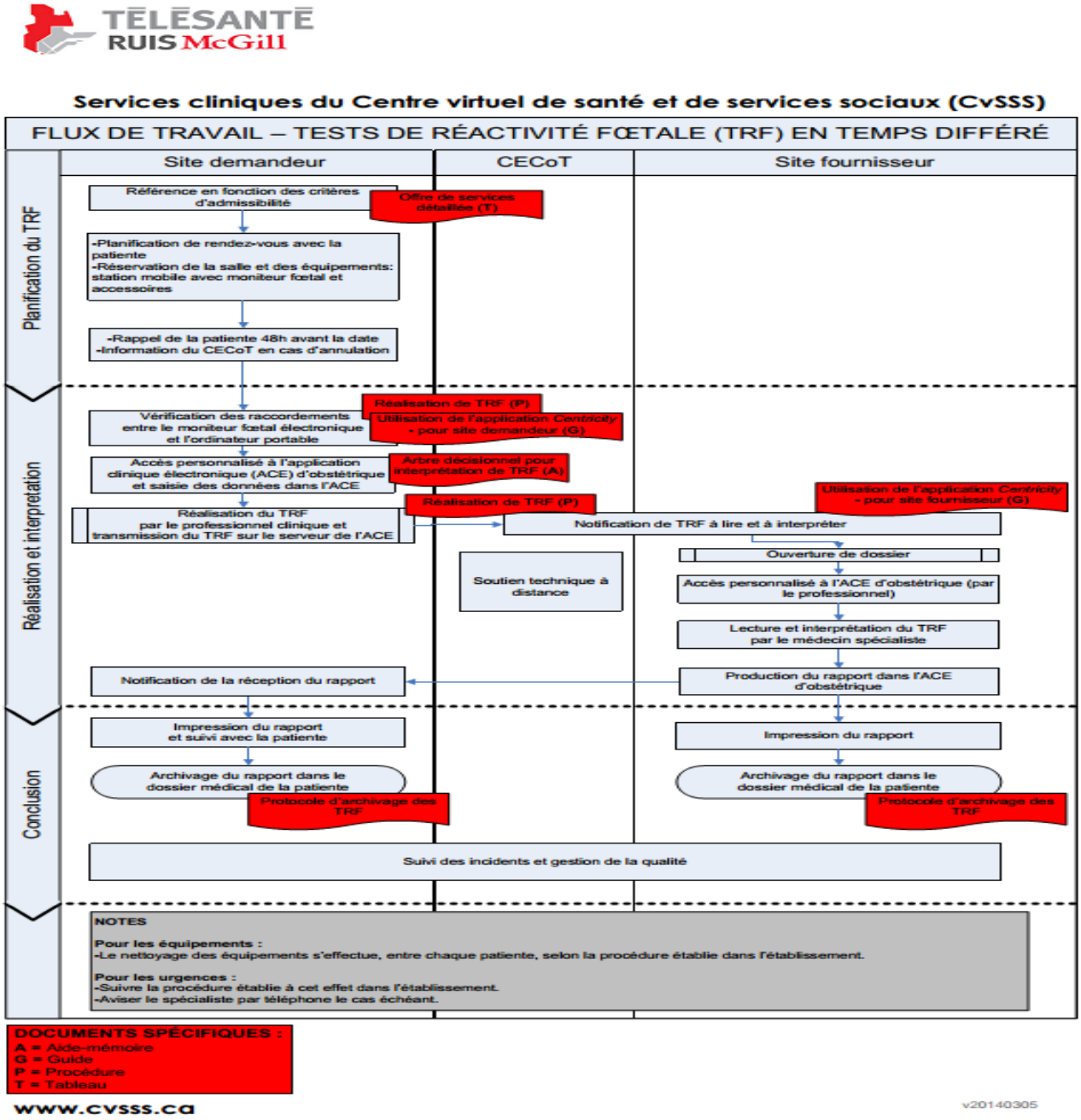
Appendix A

Telehealth NST Clinical Workflow



Appendix B

Centricity Perinatal Software Training Program

LE CENTRE VIRTUEL DE SANTÉ ET DE SERVICES SOCIAUX (CvSSS)

LA TÉLÉSANTÉ SIMPLIFIÉE!

Manuel de formation Centricity Perinatal

Chantal Bastien, BSc(N)
Coordonnatrice clinique
Centre d'expertise et de coordination de télésanté du CvSSS

18 novembre 2014

TÉLÉSANTÉ RUIS McGill

Objectifs de la formation

- Objectif principal
  - Utiliser l'application Centricity de façon intuitive
- Objectifs secondaires
  - Créer et/ou accéder au dossier d'une patiente
  - Transmettre une demande de lecture de TRF*
  - Accéder à un TRF
  - Produire et/ou accéder à un rapport TRF
  - Imprimer un rapport TRF et un tracé TRF

*TRF : test de réactivité foetale

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Ce qu'est Centricity Perinatal (CPN)

- **Plateforme partageable** du serveur au CUSM qui permet la connectivité aux sites autorisés
- **Application clinique électronique (ACE)** d'obstétrique permettant la visualisation de tracés électroniques fœtaux
- **Solution « clé en main »** qui permet l'évaluation du bien-être fœtal par la visualisation de la fréquence cardiaque fœtale et des contractions utérines

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Description du service TRF

- Capture électronique de tracés TRF
- Transmission électronique de tracés TRF
- Stockage des tracés sur un serveur accessible aux utilisateurs CPN*
- Lecture de tracés TRF à distance
- Transmission électronique de rapports

Votre solution mobile
(chariot avec moniteur fœtal et portable comprenant le logiciel CPN)

*Rappel : CPN = Centricity

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Modules adaptés au profil d'utilisateur

Rôle	Section
Infirmière, médecin **Site demandeur**	1-2-3-5-6-7
Agente administrative, RSC* **Site demandeur**	1-2-(3)-5-6-7
Infirmière, médecin **Site fournisseur**	1-2-4-5-6-7
Agente administrative, RSC **Site fournisseur**	1-2-5-6-7

Référer à la page suivante pour la description des modules

***RSC** = Représentant santé communautaire (*CHR*, en anglais)

Modules/sections du manuel

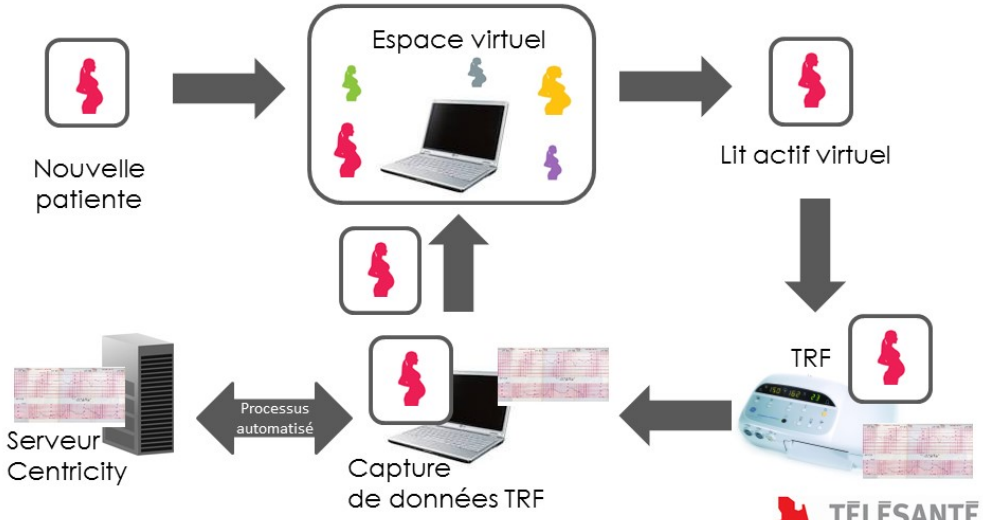
1. Organisation de la base de données CPN
2. Connexion et gestion des mots de passe
3. Inscription de la patiente et capture du tracé TRF – *Site demandeur*
4. Visualisation et interprétation du tracé TRF / Ouverture de dossier – *Site fournisseur*
5. Impression
6. Déconnexion
7. Informations pratiques

1. Organisation de la base de données CPN

Base de données CPN

- Chaque site participant a un « lit » dans l'unité « télésanté » (créé par le propriétaire licencié – CUSM)
- L'application CPN capte les données du moniteur fœtal branché au portable et les enregistre dans le lit du site correspondant
- Afin d'éviter des erreurs d'identification de tracés TRF, vous assurer de l'identité de la patiente placée dans le lit actif
  - Avant le TRF, admettre la patiente pour la capture du tracé TRF dans le lit actif de votre site
  - Après le TRF, transférer la patiente vers l'espace virtuel afin de libérer le lit actif pour la prochaine patiente

Schéma du processus de capture de TRF



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Actions au site demandeur

- Toujours vérifier si le dossier de la patiente existe déjà dans la base de données en recherchant la patiente par
  - Numéro RAMQ (identifiant de la patiente)
  - Nom de famille de la patiente
    - Si le dossier est déjà existant, transférez la patiente dans le lit actif virtuel de votre site
    - Sinon, créer un nouveau dossier pour la patiente dans le lit actif virtuel de votre site
- Réaliser le TRF et capturer les données dans CPN
- Lorsque le TRF est complété, transférer la patiente dans l'espace virtuel afin de libérer votre lit actif virtuel pour une future patiente
- Notifier le site fournisseur du tracé TRF à interpréter
- Vous assurer de la réception et de l'impression du rapport
- Imprimer le tracé et le rapport TRF

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Actions au site fournisseur

- Sélection de la patiente dans l'espace virtuel
- Lecture et interprétation du tracé TRF
- Production du rapport TRF
- Ouverture de dossier
- Impression du tracé et du rapport TRF
- Notification au site demandeur de rapport TRF

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2. Connexion et gestion des mots de passe

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Connexion

- Préalable :
  - Compléter la **demande de profil CPN** et obtenir vos informations d'accès
    - Nom d'utilisateur
    - Mot de passe
  - Avoir une solution mobile de TRF à distance, adéquatement branchée
- Pour lancer l'application, si la page d'accueil CPN n'est pas déjà ouverte sur le portable dédié, cliquer sur l'icône « Télésanté »* sur le bureau


LE CENTRE VIRTUEL DE SANTÉ ET DE SERVICES SOCIAUX (CvSSS)
LA TÉLÉSANTÉ SIMPLIFIÉE !

Prérequis avant de compléter cette demande :

- ✓ Approbation de la participation de votre site aux services de TRF à distance
- ✓ Installation adéquate de l'application clinique électronique d'obstétrique Centricity Perinatal dans l'ordinateur portable relié au moniteur fœtal électronique
- ✓ Personnel qualifié pour effectuer la capture ou l'interprétation de TRF

Formulaire de demande d'accès utilisateur pour l'application Centricity

	Instructions	Informations à compléter
Nom		
Prénom		
Fonction	Indiquer un "x" à côté du choix	1 infirmière 2 médecin 3 sage-femme 4 gestionnaire administratif
Clinique d'emploi		
Numéro de permis	Pour médecin et infirmière	
Numéro d'employé	Pour gestionnaire administratif	
Téléphone (travail)	Soit permanent qui répondra l'utilisateur au travail	
Courriel (Lotus ou autre)		
Nom du gestionnaire autorisant la demande de profil		
Téléphone du gestionnaire ci-dessus		
Courriel du gestionnaire ci-dessus		
Nom de l'établissement		
Adresse de l'établissement		
Ville		
Province		Qc
Pays		
Date envoyé		

Suite à l'envoi de ce formulaire au CECoT (par votre gestionnaire de service TRF, obligatoirement), prévoir environ 7 jours ouvrables pour réception de votre NOM D'USAGER et votre MOT DE PASSE

Pour plus d'information, contacter le
Centre d'expertise et de coordination de télésanté (CECoT)
Téléphone : 514 412-4294
ou 1 877-536-3202 sans frais au Québec
du lundi au vendredi, entre 8 h et 16 h HNE

Réservé à usage administratif
username:
temp password:

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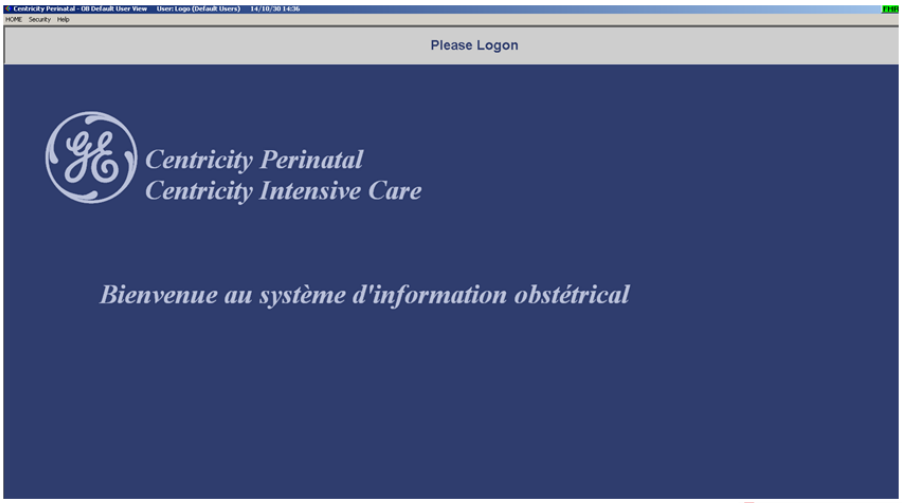
Page d'accueil CPN



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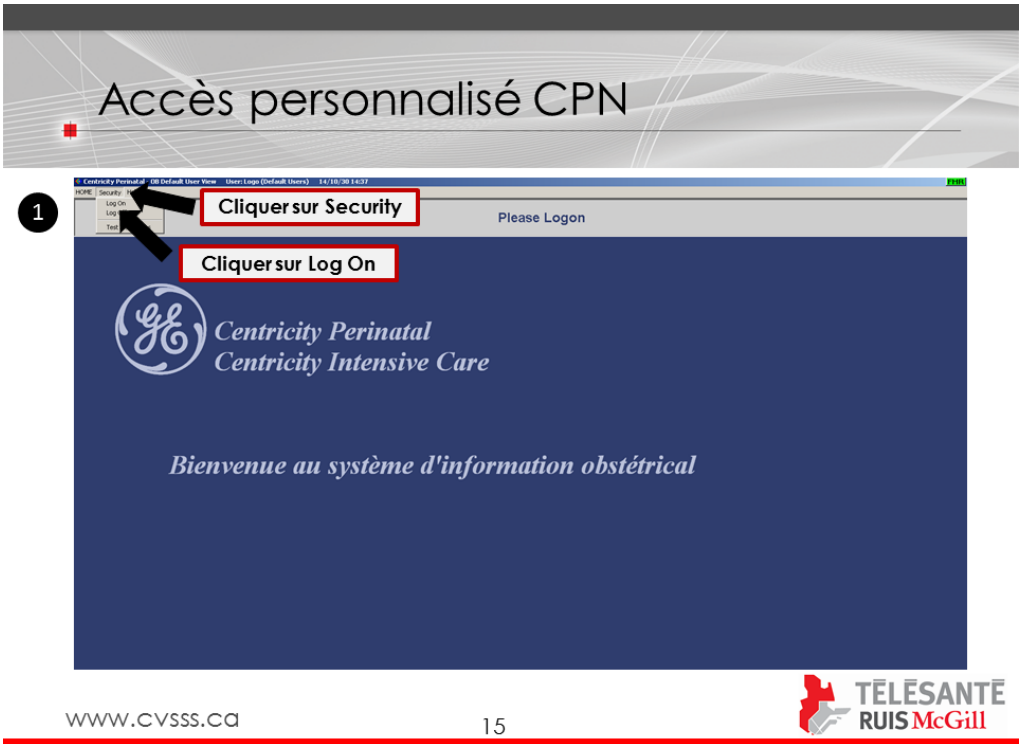
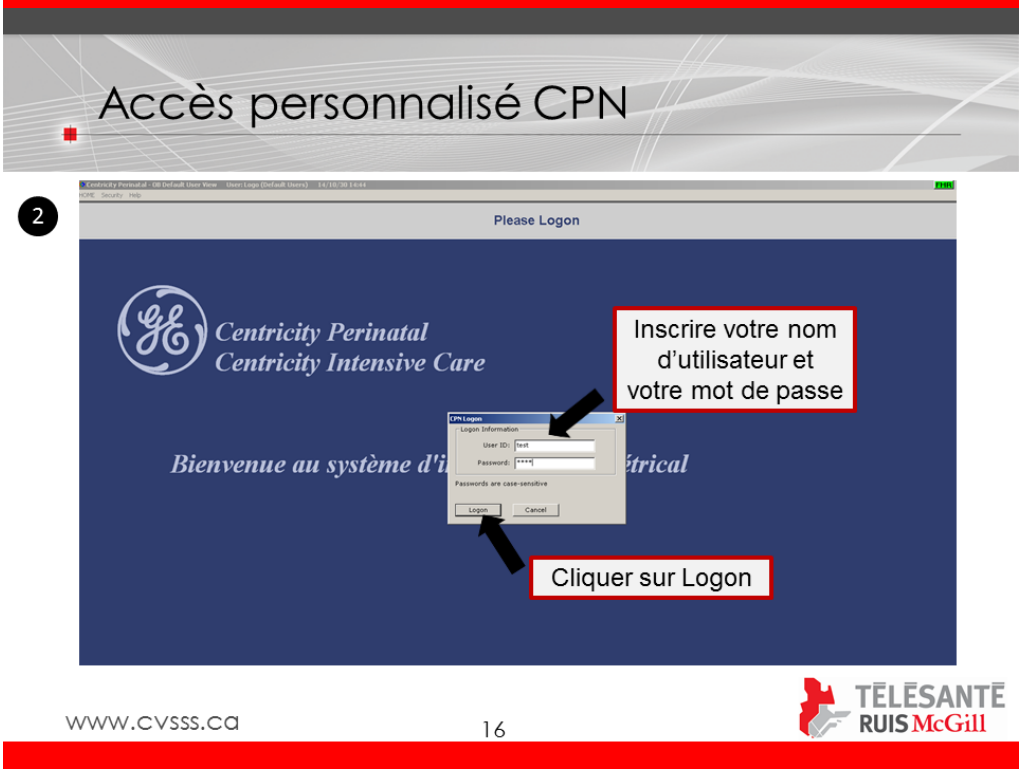
TÉLÉSANTÉ RUIS McGill


Accès personnalisé CPN
1
Cliquer sur Security
Cliquer sur Log On
Please Logon
Centricity Perinatal
Centricity Intensive Care
Bienvenue au système d'information obstétrical
www.cvsss.ca
15
TÉLÉSANTÉ
RUIS McGill

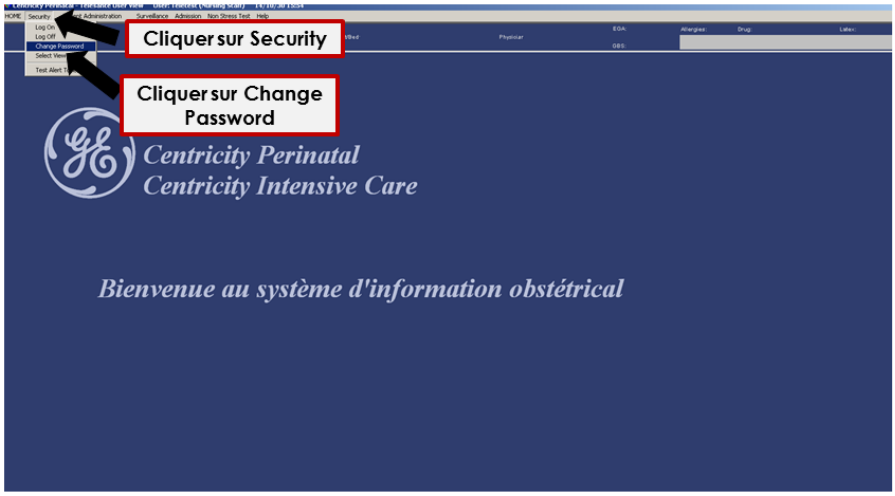

Accès personnalisé CPN
2
Please Logon
Centricity Perinatal
Centricity Intensive Care
Inscrire votre nom d'utilisateur et votre mot de passe
Cliquer sur Logon
www.cvsss.ca
16
TÉLÉSANTÉ
RUIS McGill

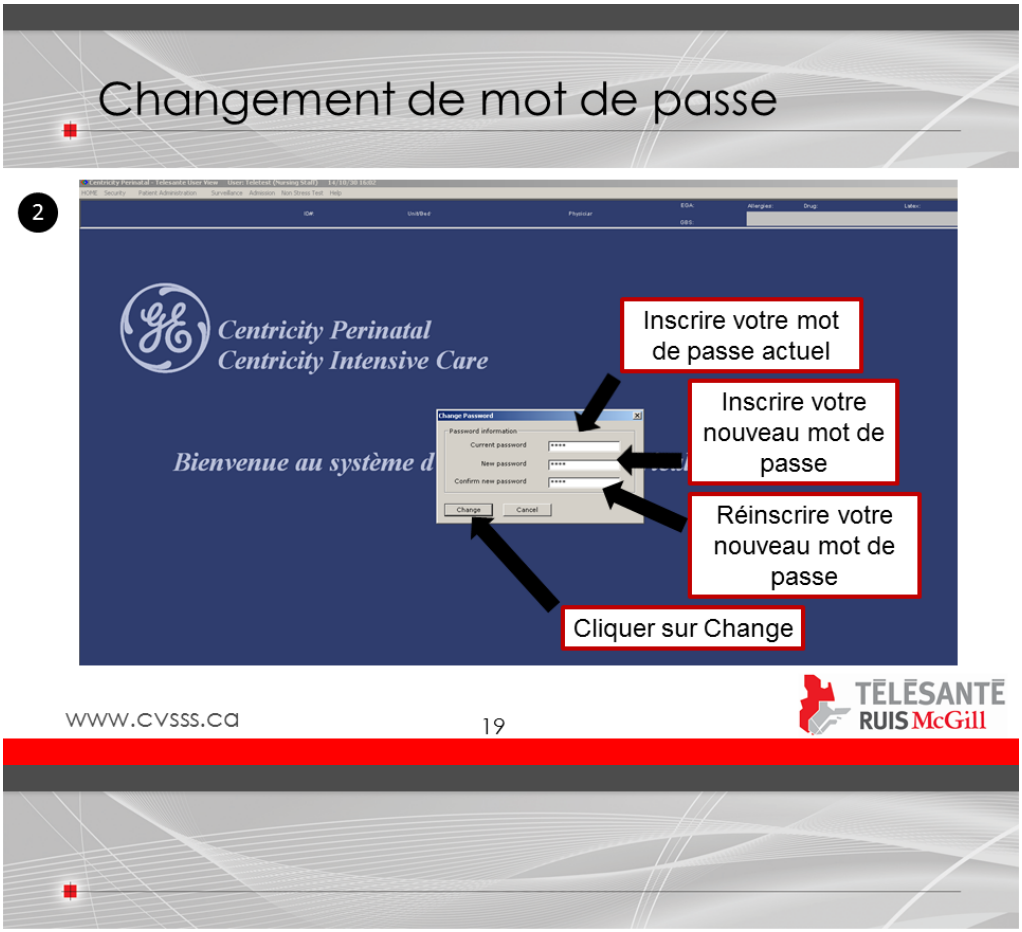
Gestion du mot de passe

- Vous devez changer votre mot de passe :
  - lors de la connexion initiale à CPN
  - lorsque votre mot de passe est expiré (aux 3 mois)

Changement de mot de passe

1





3. Inscription de la patiente et capture du tracé TRF

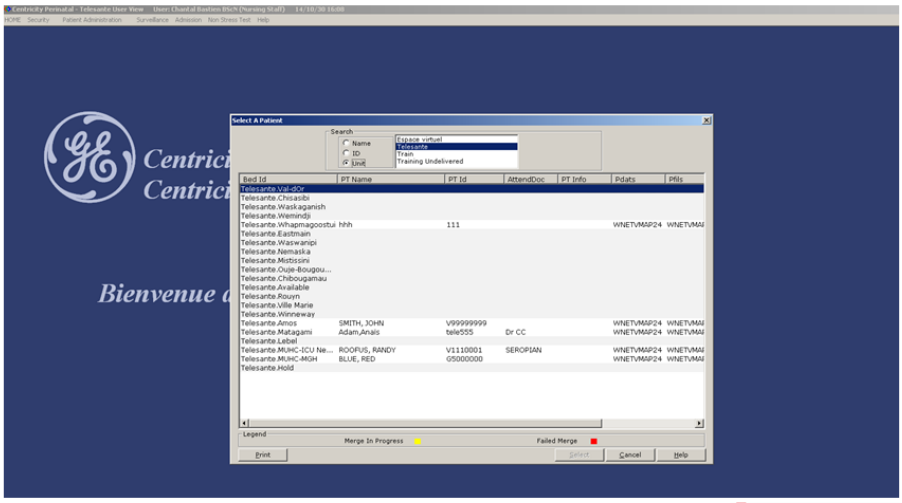
Site demandeur

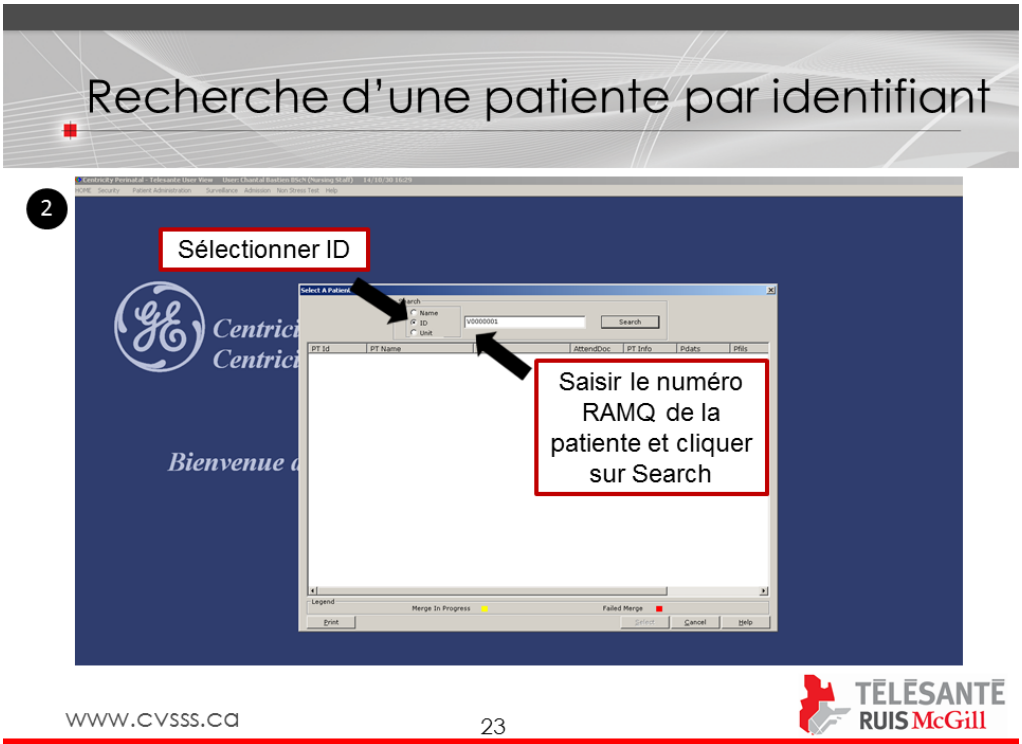
Sélection de la patiente

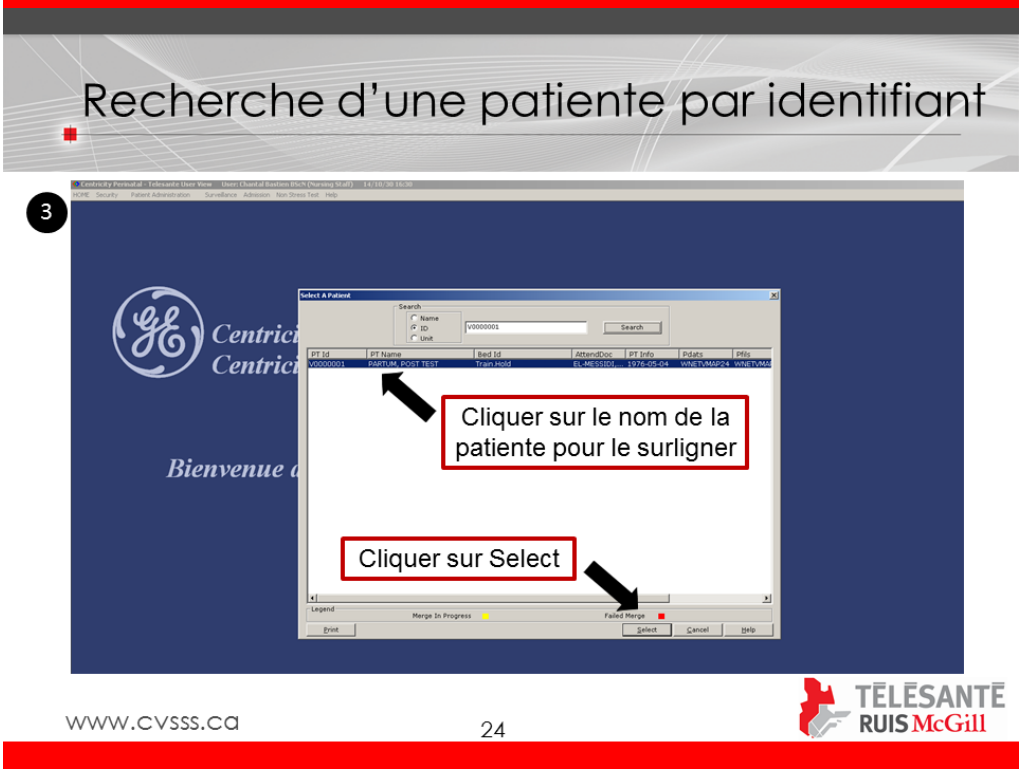
- Toujours vérifier si le dossier de la patiente existe déjà dans l'espace virtuel
- La fenêtre de recherche de patiente s'ouvre dès la connexion
- Si la fenêtre ne s'ouvre pas :
  - Cliquer sur Patient Administration
  - Cliquer sur Select a Patient

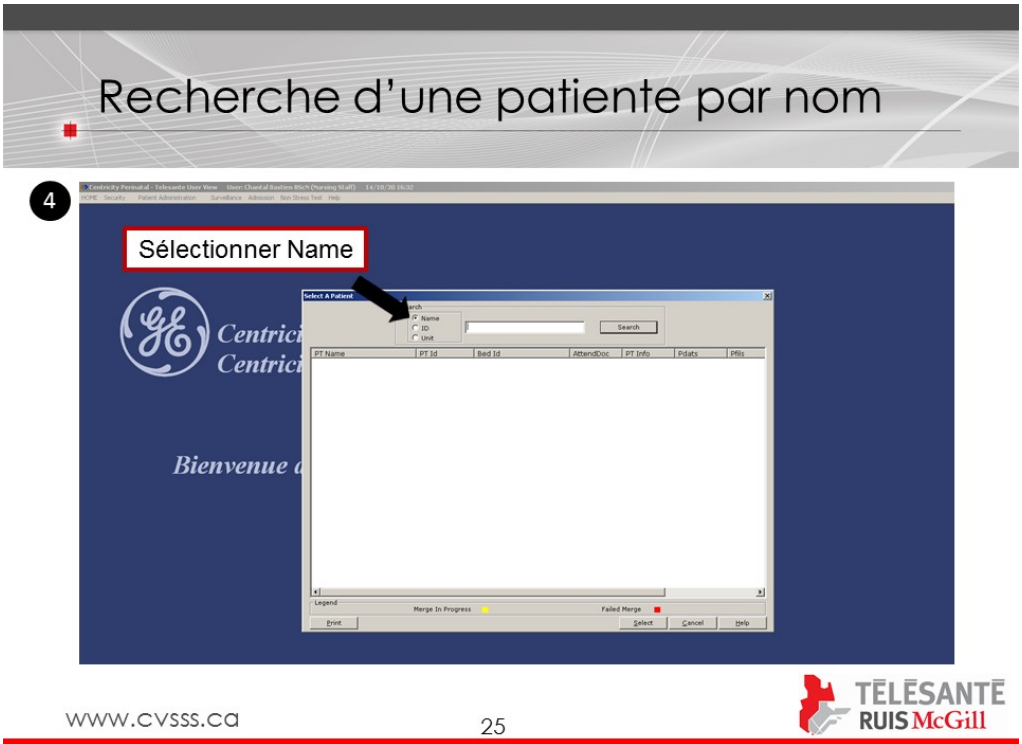
Recherche de la patiente pour admission au lit virtuel actif

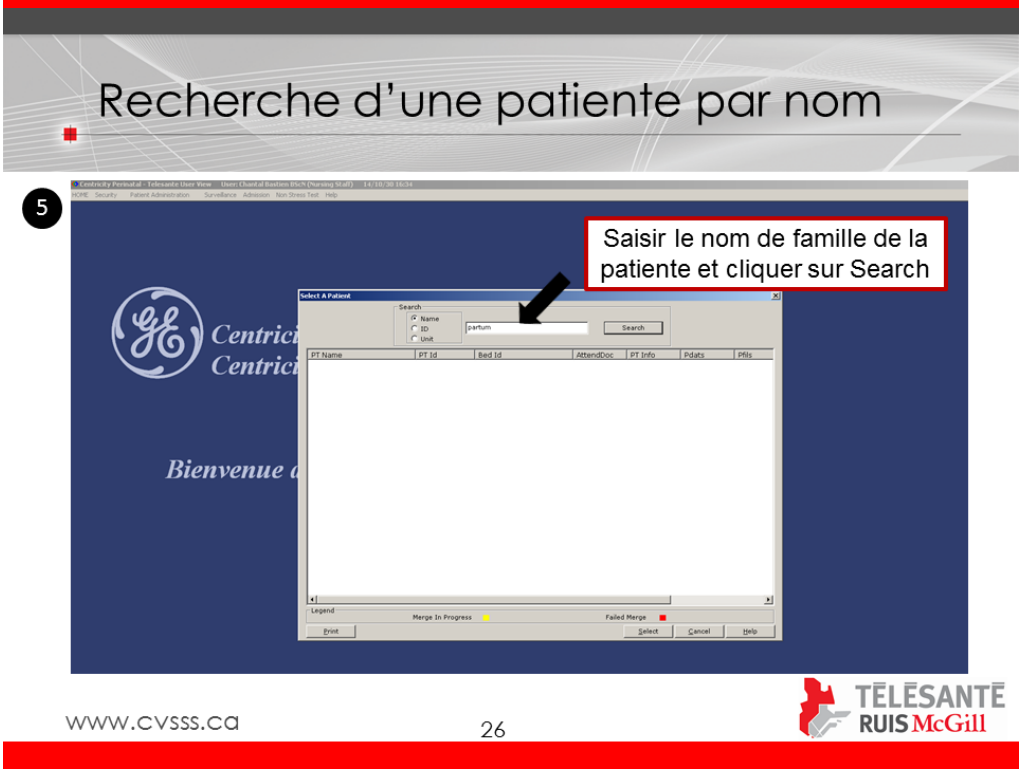
1




Recherche d'une patiente par identifiant
2
Sélectionner ID
Saisir le numéro RAMQ de la patiente et cliquer sur Search
www.cvsss.ca
23
TÉLÉSANTÉ RUIS McGill

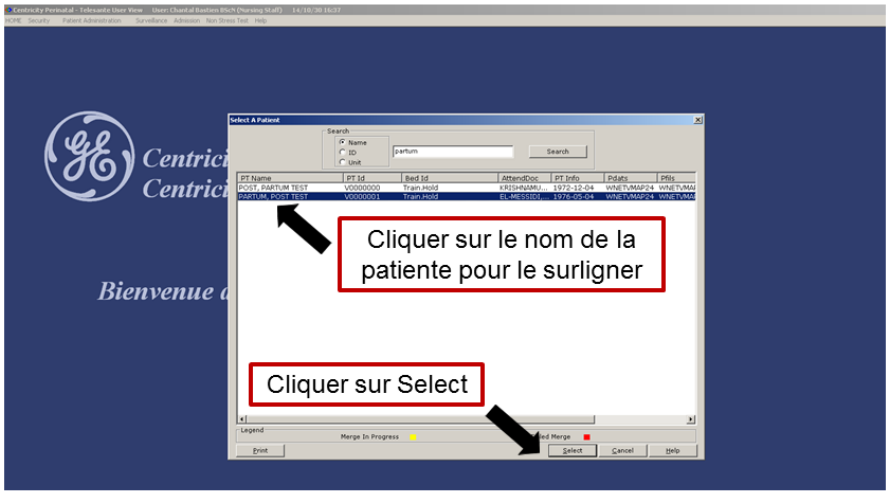

Recherche d'une patiente par identifiant
3
Cliquer sur le nom de la patiente pour le surligner
Cliquer sur Select
www.cvsss.ca
24
TÉLÉSANTÉ RUIS McGill


Recherche d'une patiente par nom
4
Sélectionner Name
Bienvenue
www.cvsss.ca
25
TÉLÉSANTÉ
RUIS McGill


Recherche d'une patiente par nom
5
Saisir le nom de famille de la patiente et cliquer sur Search
Bienvenue
www.cvsss.ca
26
TÉLÉSANTÉ
RUIS McGill

Recherche d'une patiente par nom

6



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Sélection de la patiente

- En cliquant sur Select, le dossier de la patiente s'affiche dans le bandeau
- Toujours s'assurer que le nom de la patiente sélectionnée apparaît dans le bandeau en haut de l'écran
- Valider le nom et le numéro d'identifiant avant de placer la patiente sur le moniteur foetal

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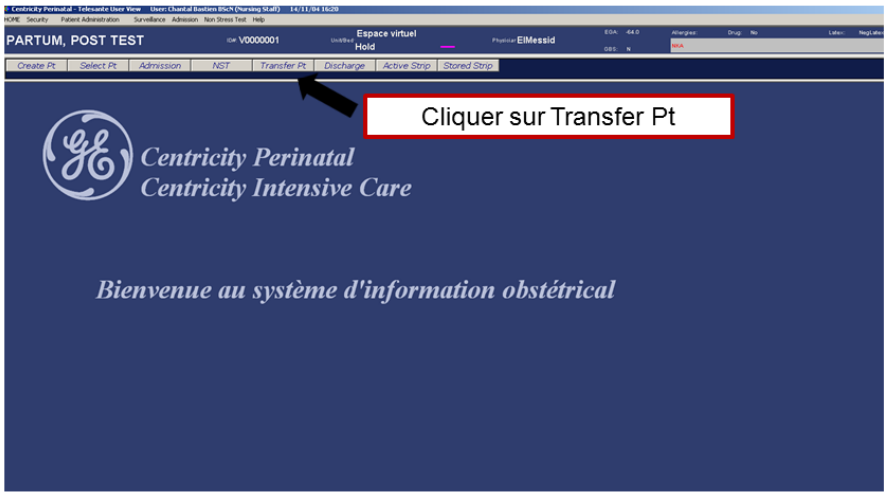
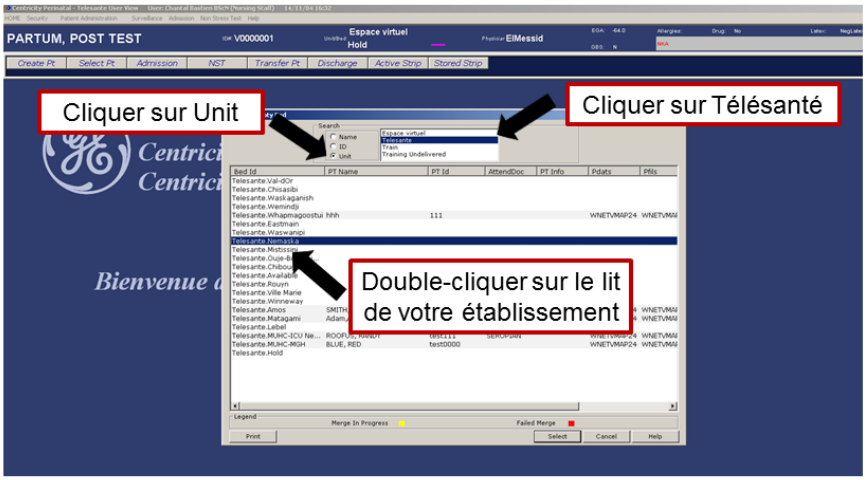
Activation de la patiente dans le lit virtuel actif

1



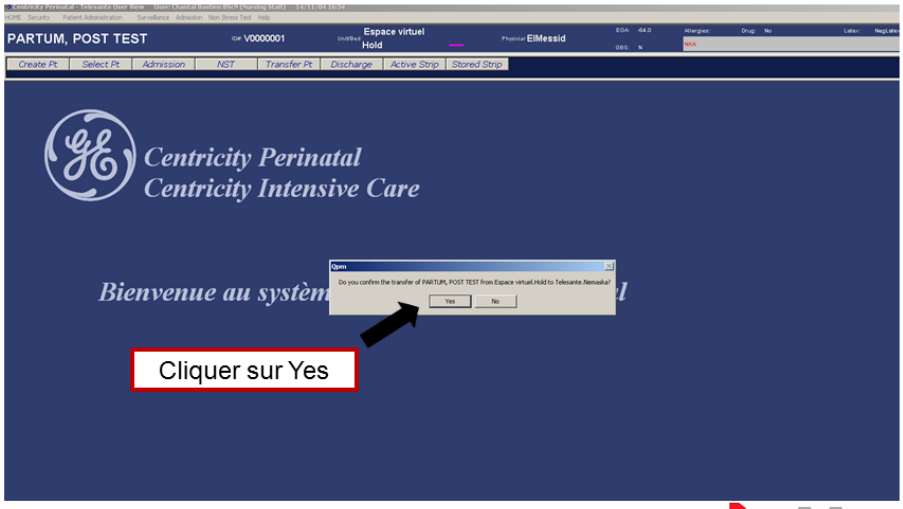
Activation de la patiente dans le lit virtuel actif

2



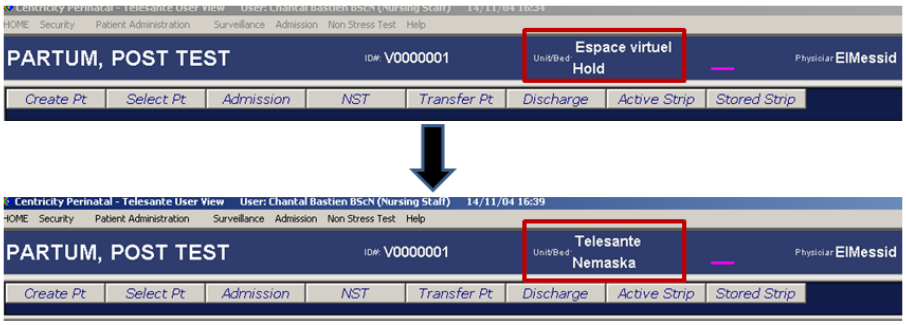
Activation de la patiente dans le lit virtuel actif

3



Double vérification de la patiente

4

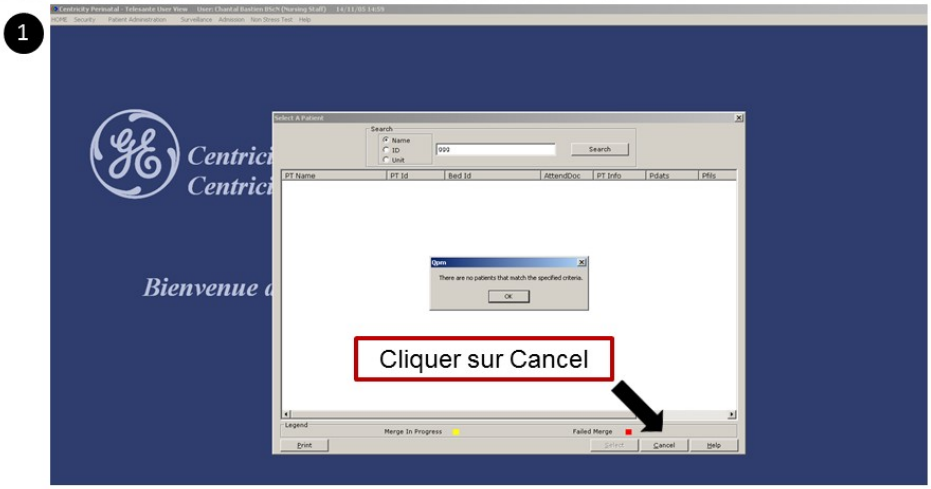


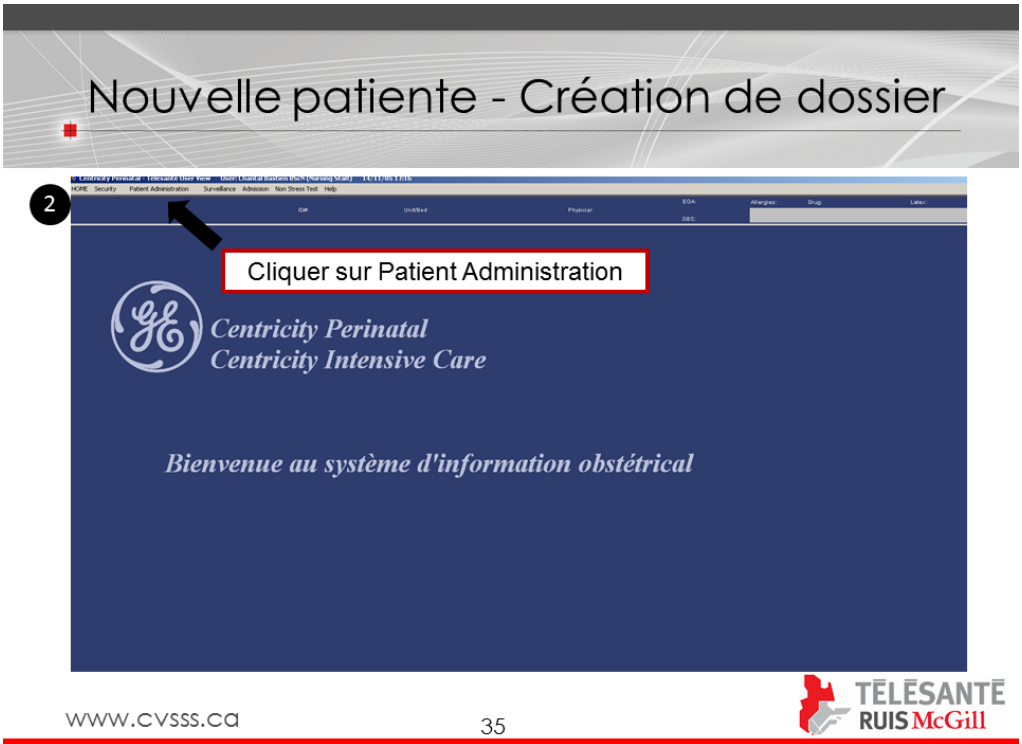
- Valider le nom, le numéro d'identifiant et le lit de votre site avant de placer la patiente sur le moniteur foetal

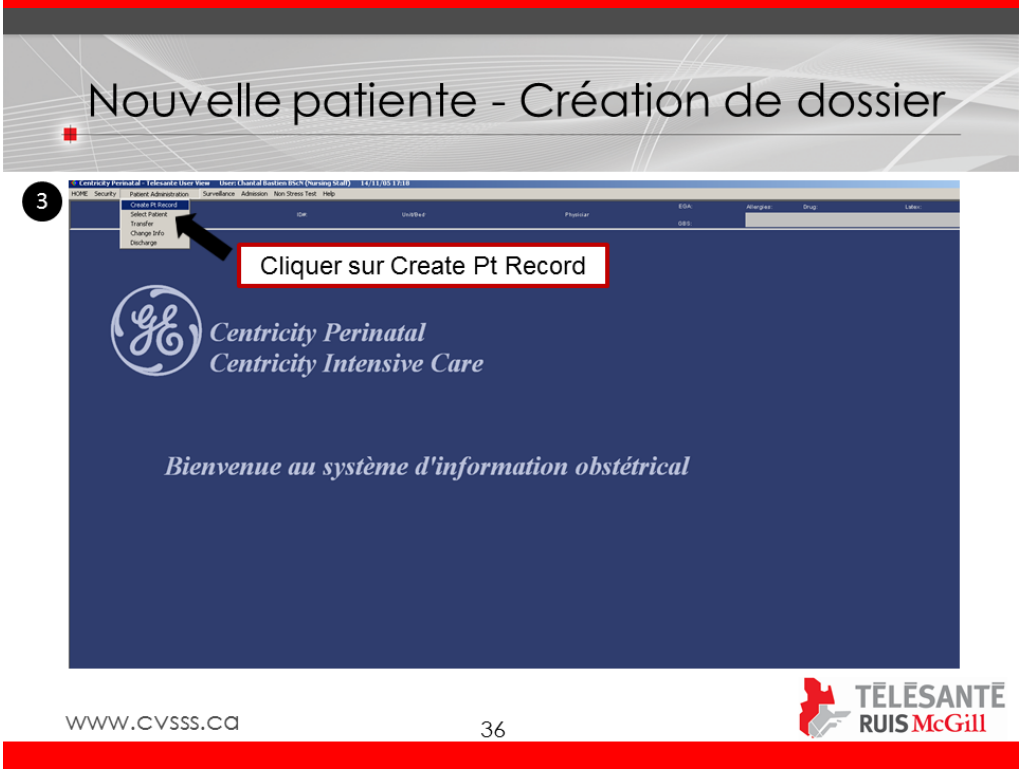
Nouvelle patiente

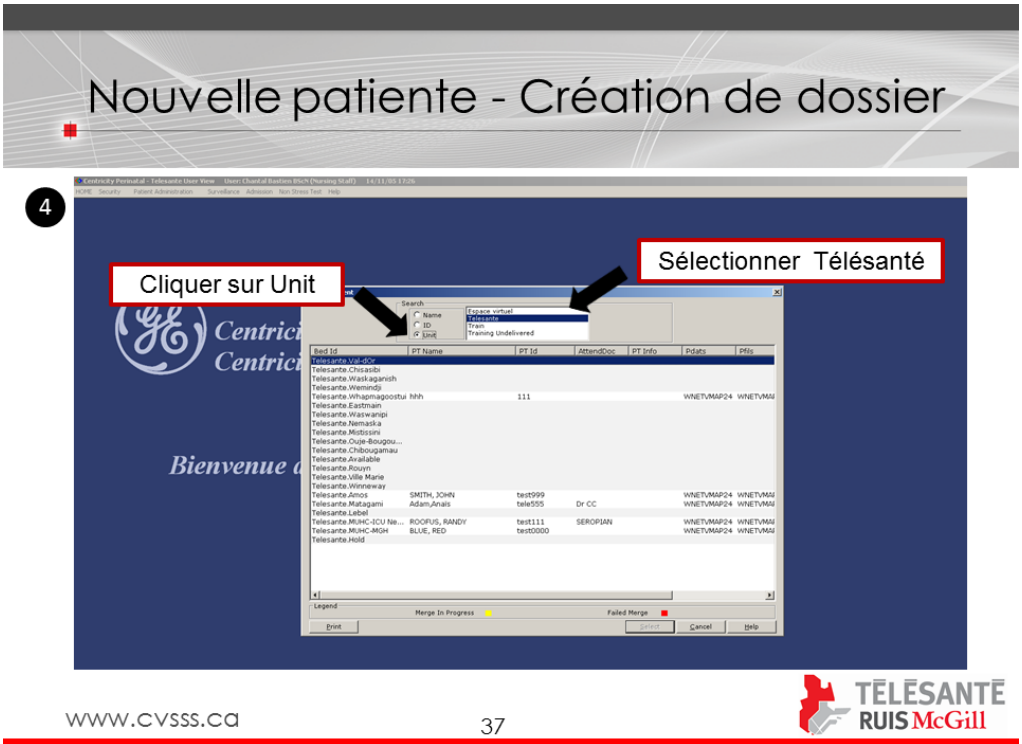
- Si la recherche du dossier de la patiente est infructueuse, un nouveau dossier doit être créé
- Lors de sa création, le dossier de la patiente sera inscrit dans le lit actif de votre site

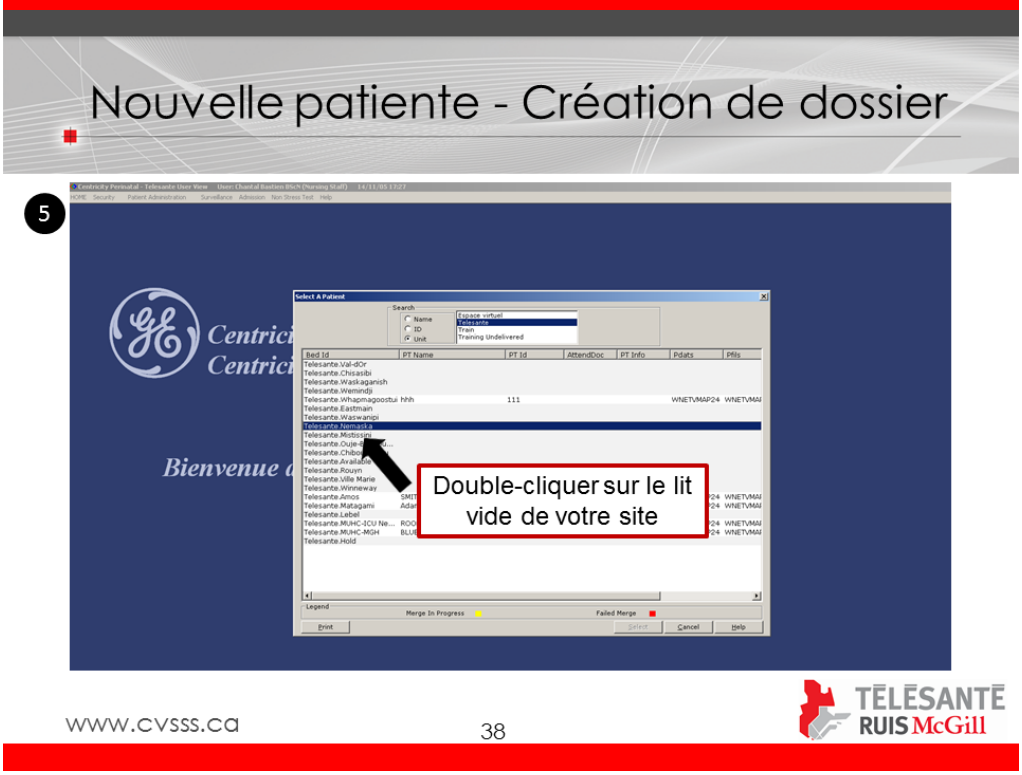
Nouvelle patiente - Création de dossier

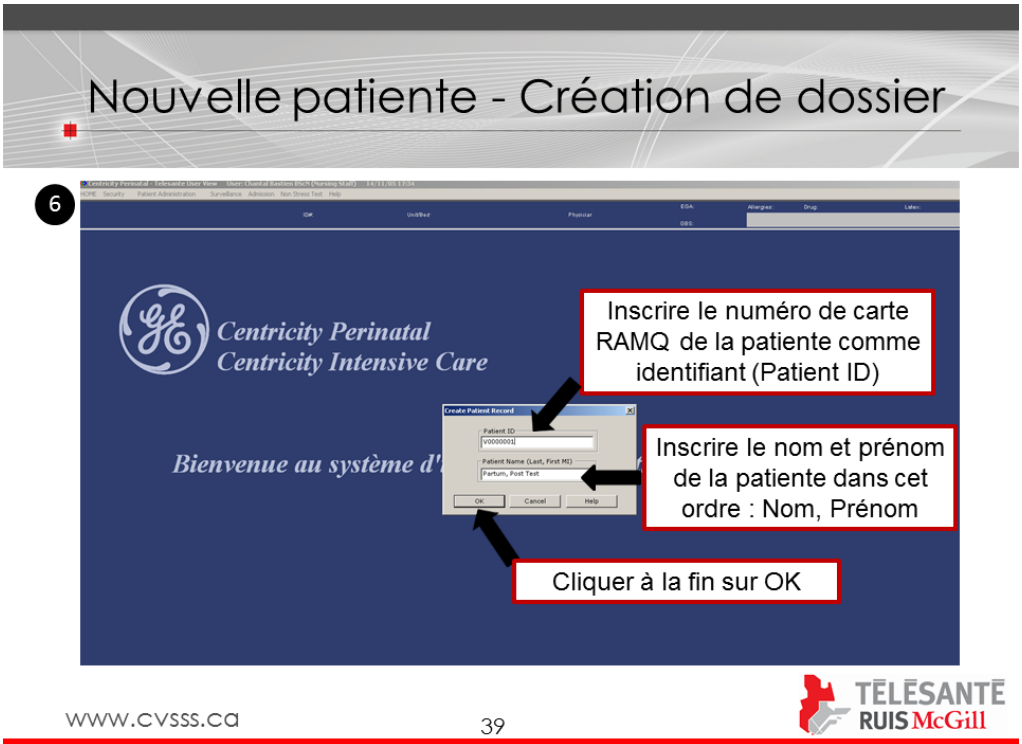


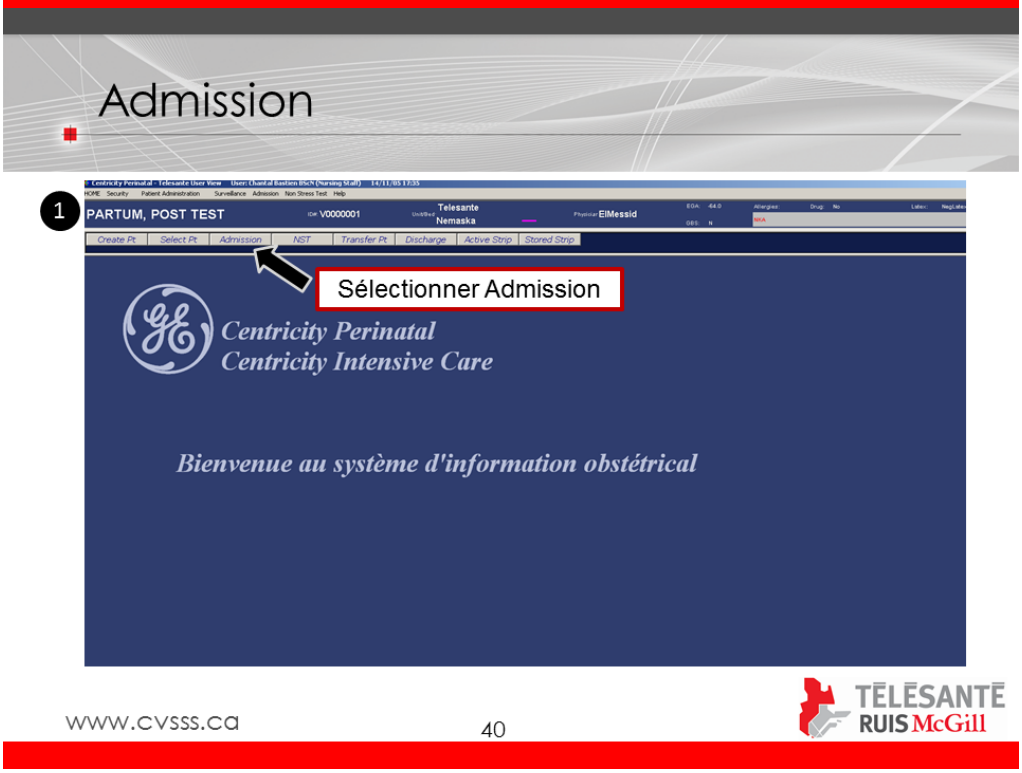

Nouvelle patiente - Création de dossier
2
Cliquer sur Patient Administration
Centricity Perinatal
Centricity Intensive Care
Bienvenue au système d'information obstétrical
www.cvsss.ca
35
TÉLÉSANTÉ
RUIS McGill

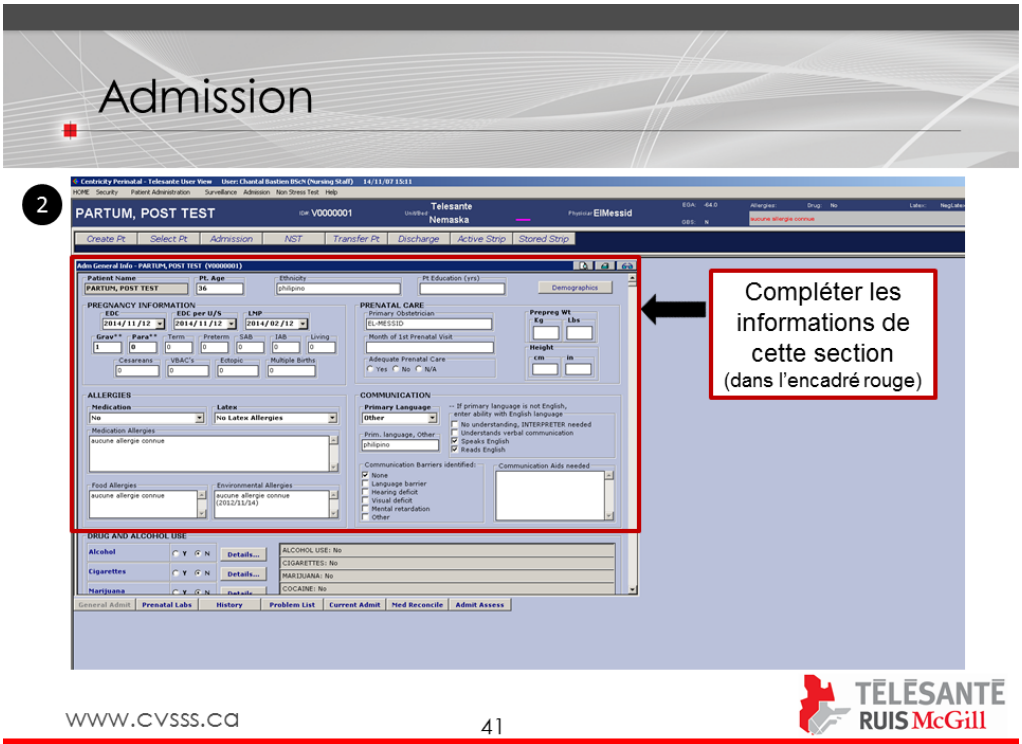

Nouvelle patiente - Création de dossier
3
Cliquer sur Create Pt Record
Centricity Perinatal
Centricity Intensive Care
Bienvenue au système d'information obstétrical
www.cvsss.ca
36
TÉLÉSANTÉ
RUIS McGill

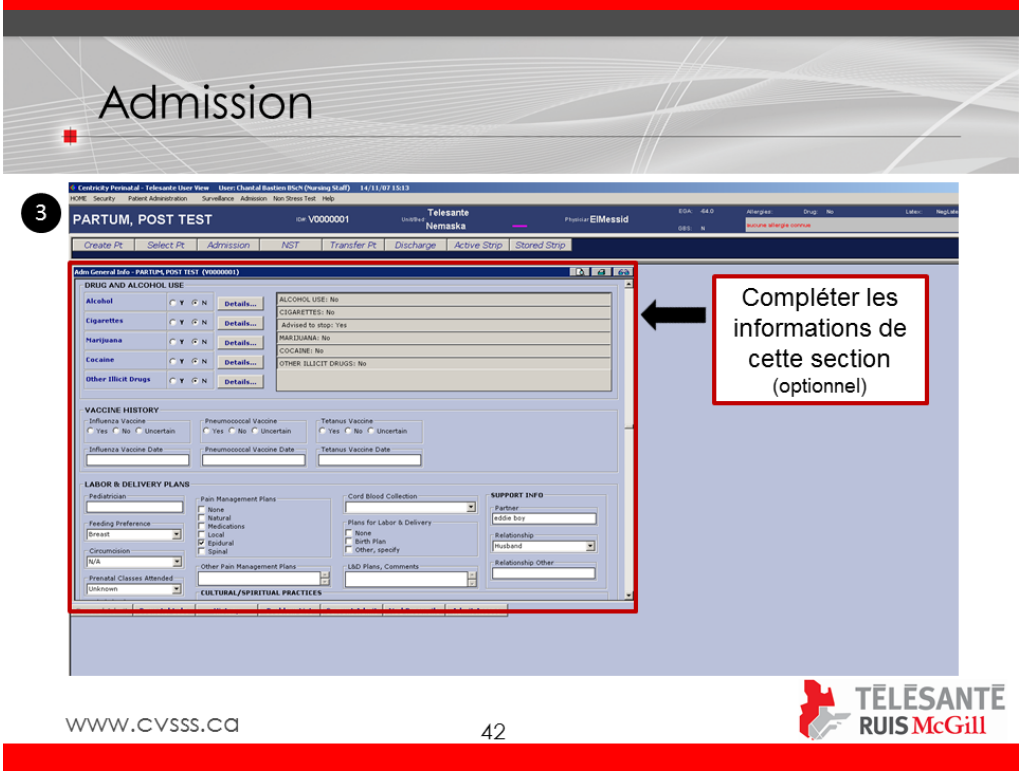

Nouvelle patiente - Création de dossier
4
Cliquer sur Unit
Sélectionner Télésanté
www.cvsss.ca
37
TÉLÉSANTÉ
RUIS McGill

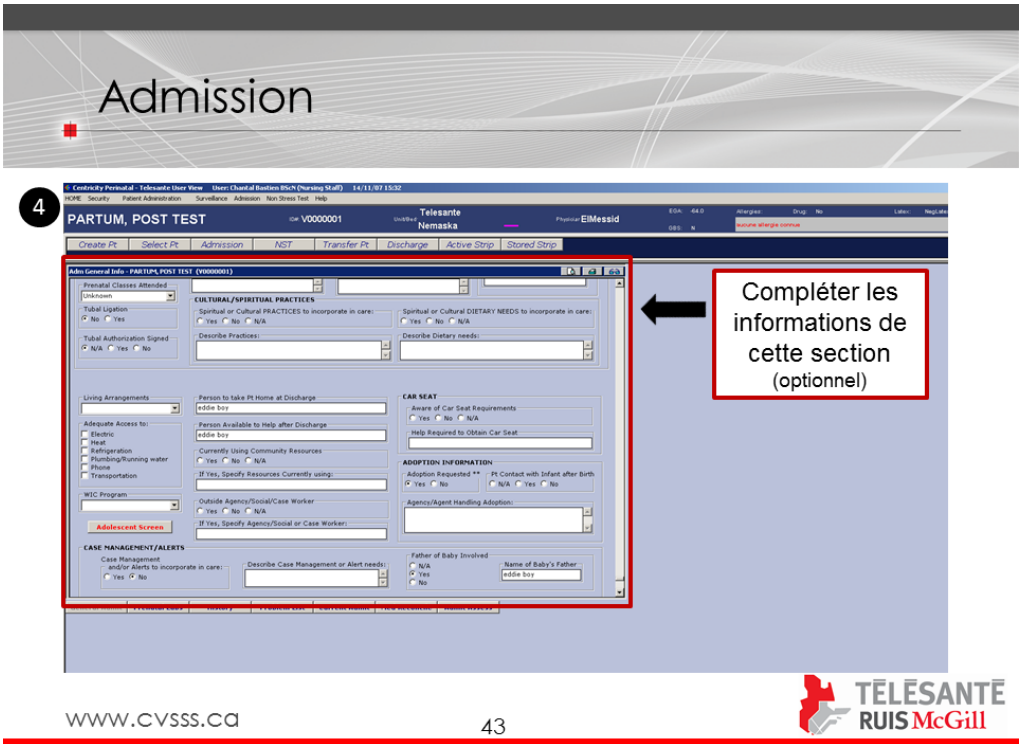

Nouvelle patiente - Création de dossier
5
Double-cliquer sur le lit vide de votre site
www.cvsss.ca
38
TÉLÉSANTÉ
RUIS McGill

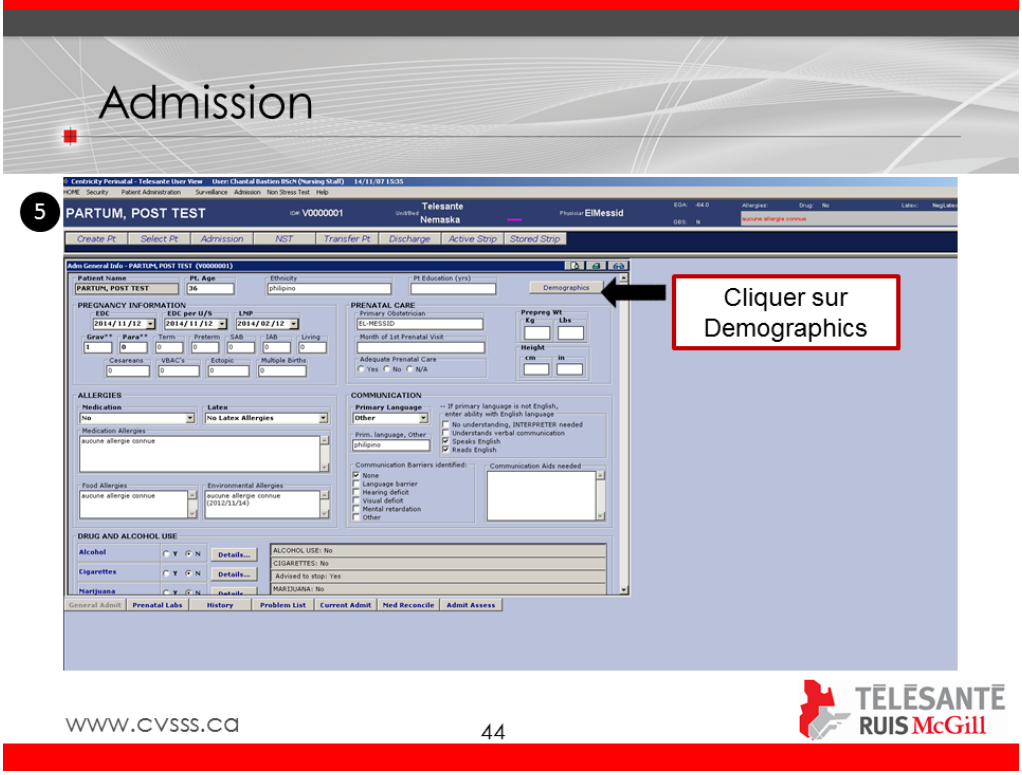

Nouvelle patiente - Création de dossier
6
Centricity Perinatal
Centricity Intensive Care
Bienvenue au système d'
Inscrire le numéro de carte RAMQ de la patiente comme identifiant (Patient ID)
Inscrire le nom et prénom de la patiente dans cet ordre : Nom, Prénom
Cliquer à la fin sur OK
www.cvsss.ca
39
TÉLÉSANTÉ RUIS McGill


Admission
1
PARTUM, POST TEST
Sélectionner Admission
Centricity Perinatal
Centricity Intensive Care
Bienvenue au système d'information obstétrical
www.cvsss.ca
40
TÉLÉSANTÉ RUIS McGill


Admission
2
PARTUM, POST TEST
Compléter les informations de cette section
(dans l'encadré rouge)
www.cvsss.ca
41
TÉLÉSANTÉ RUIS McGill


Admission
3
PARTUM, POST TEST
Compléter les informations de cette section
(optionnel)
www.cvsss.ca
42
TÉLÉSANTÉ RUIS McGill


Admission
4
PARTUM, POST TEST
Compléter les informations de cette section (optionnel)
www.cvsss.ca
43
TÉLÉSANTÉ RUIS McGill


Admission
5
PARTUM, POST TEST
Cliquer sur Demographics
www.cvsss.ca
44
TÉLÉSANTÉ RUIS McGill

Admission

6

Compléter les informations de cette section

★Champs obligatoires

Cliquer sur OK, à la fin

www.cvsss.ca 45

TÉLÉSANTÉ RUIS McGill

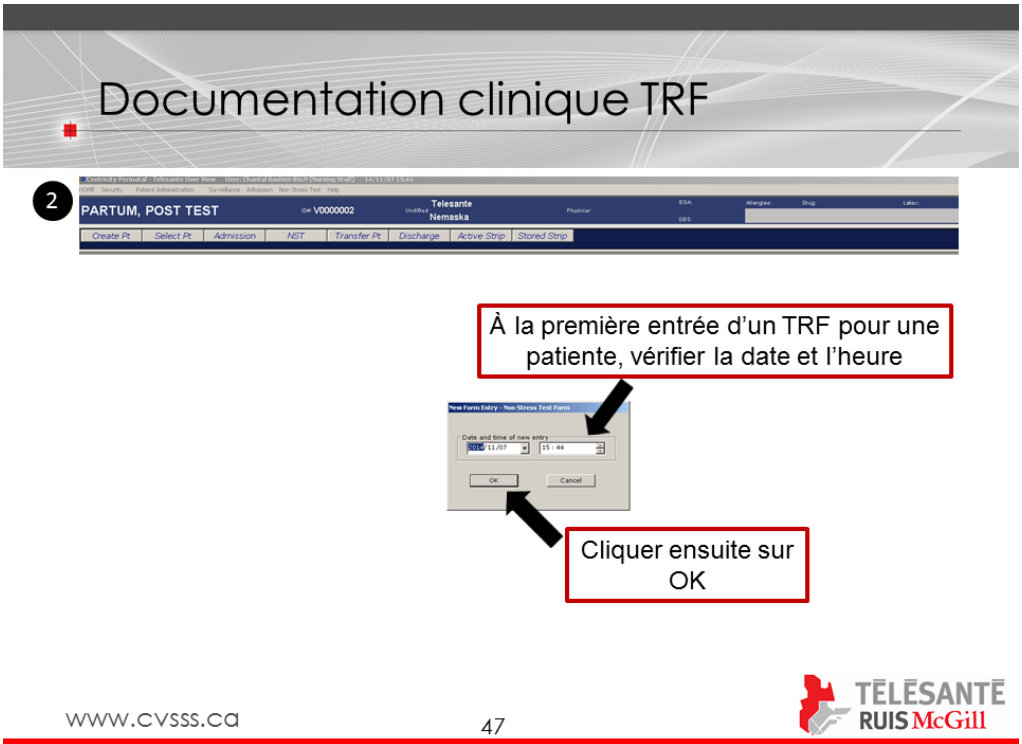
Documentation clinique TRF

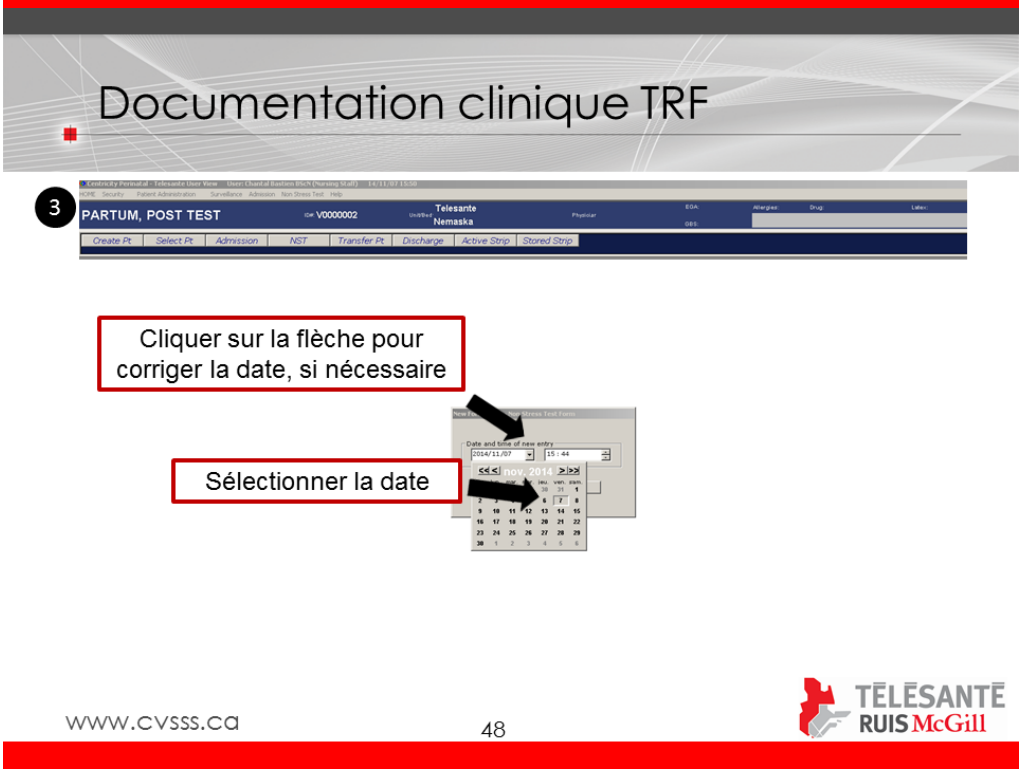
1

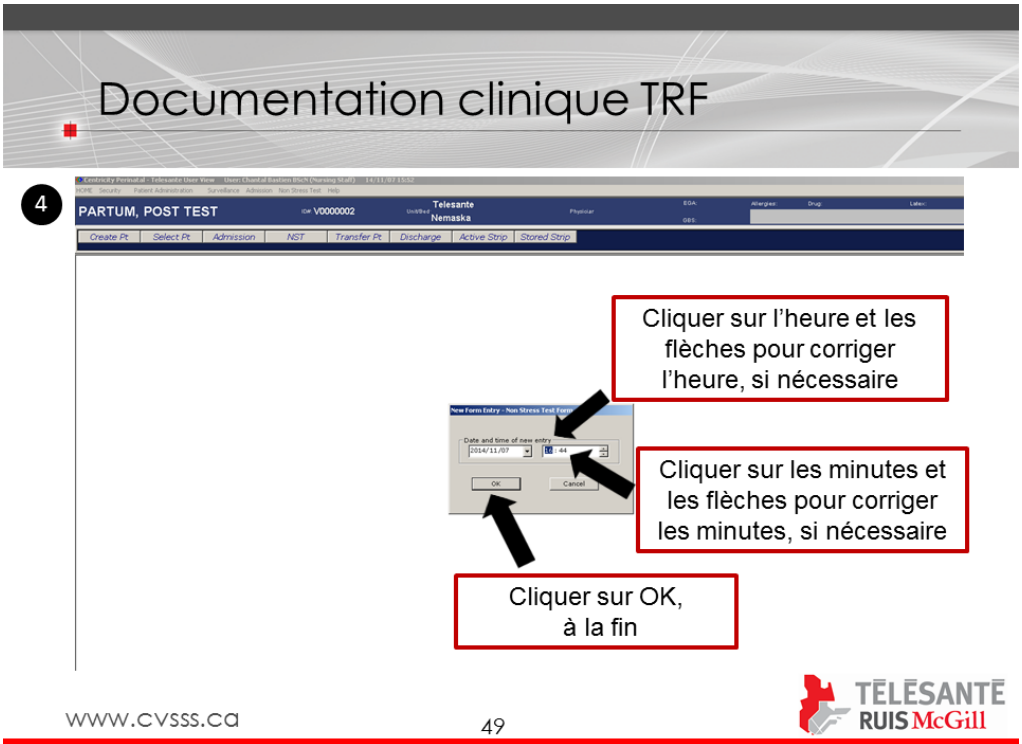
Cliquer sur NST

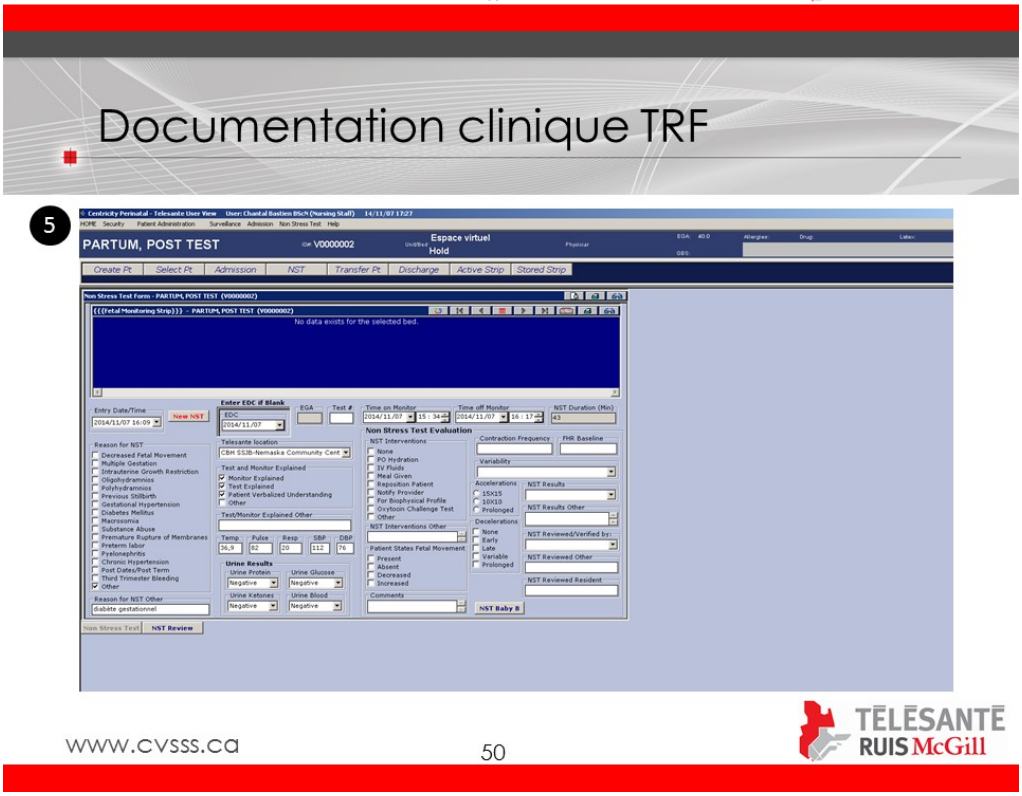
www.cvsss.ca 46

TÉLÉSANTÉ RUIS McGill


Documentation clinique TRF
2
PARTUM, POST TEST
Telesante
Nemaska
Create Pt
Select Pt
Admission
NST
Transfer Pt
Discharge
Active Strip
Stored Strip
À la première entrée d'un TRF pour une patiente, vérifier la date et l'heure
Cliquer ensuite sur OK
www.cvsss.ca
47
TÉLÉSANTÉ
RUIS McGill

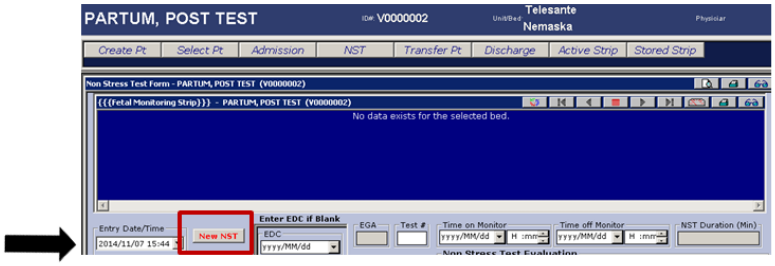

Documentation clinique TRF
3
PARTUM, POST TEST
Telesante
Nemaska
Create Pt
Select Pt
Admission
NST
Transfer Pt
Discharge
Active Strip
Stored Strip
Cliquer sur la flèche pour corriger la date, si nécessaire
Sélectionner la date
www.cvsss.ca
48
TÉLÉSANTÉ
RUIS McGill


Documentation clinique TRF
4
PARTUM, POST TEST
Telesante Nemaska
Cliquer sur l'heure et les flèches pour corriger l'heure, si nécessaire
Cliquer sur les minutes et les flèches pour corriger les minutes, si nécessaire
Cliquer sur OK, à la fin
www.cvsss.ca
49
TÉLÉSANTÉ RUIS McGill


Documentation clinique TRF
5
PARTUM, POST TEST
Espace virtuel Hold
www.cvsss.ca
50
TÉLÉSANTÉ RUIS McGill

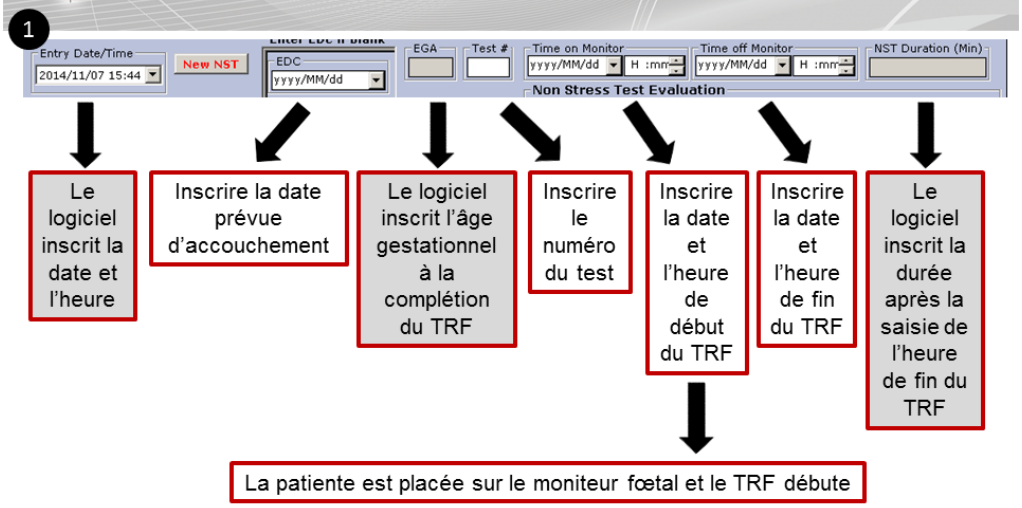
Documentation clinique TRF

- Si vous arrivez sur la page du TRF après avoir cliqué sur le bouton NST, vous devez cliquer sur **New NST** avant d'entrer de nouvelles données



- Ensuite suivez les instructions de date et heure décrites

Capture des données du TRF



Capture des données du TRF

2

Compléter les renseignements (site demandeur)

Section rapport du TRF (site fournisseur)

Inscrire les décimales avec une virgule
Ex : 36,9

Compléter les menus déroulants

www.cvsss.ca 53

TÉLÉSANTÉ RUIS McGill

Capture des données du TRF – si jumeau

1

Cliquer sur NST Baby B

www.cvsss.ca 54

TÉLÉSANTÉ RUIS McGill

Capture des données du TRF – si jumeau

2

Compléter les données cliniques pour le bébé B

Non Stress Test Baby B

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Capture et complétion des données du TRF

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Exemple de données de TRF

Entry Date/Time: 2014/11/07 16:09 — New NST

Enter EDC if Blank: EDC 2014/11/07 — EGA — Test #

Time on Monitor: 2014/11/07 15 : 34 — Time off Monitor: 2014/11/07 16 : 17 — NST Duration (Min): 43

Reason for NST:
- Decreased Fetal Movement
- Multiple Gestation
- Intrauterine Growth Restriction
- Oligohydramnios
- Polyhydramnios
- Previous Stillbirth
- Gestational Hypertension
- Diabetes Mellitus
- Macrosomia
- Substance Abuse
- Premature Rupture of Membranes
- Preterm labor
- Pyelonephritis
- Chronic Hypertension
- Post Dates/Post Term
- Third Trimester Bleeding
- [x] Other

Reason for NST Other: diabète gestationnel

Telesante location

Test and Monitor Explained:
- [x] Monitor Explained
- [x] Test Explained
- [x] Patient Verbalized Understanding
- Other

Test/Monitor Explained Other

Temp 36,9 — Pulse 82 — Resp 20 — SBP 112 — DBP 76

Urine Results: Urine Protein Negative — Urine Glucose Negative — Urine Ketones Negative — Urine Blood Negative

Non Stress Test Evaluation

NST Interventions:
- None
- PO Hydration
- IV Fluids
- Meal Given
- Reposition Patient
- Notify Provider
- For Biophysical Profile
- Oxytocin Challenge Test
- Other

NST Interventions Other

Patient States Fetal Movement:
- Present
- Absent
- Decreased
- Increased

Comments

Contraction Frequency — FHR Baseline

Variability

Accelerations: 15X15 — 10X10 — Prolonged

Decelerations:
- None
- Early
- Late
- Variable
- Prolonged

NST Results — NST Results Other — NST Reviewed/Verified by: — NST Reviewed Other — NST Reviewed Resident

NST Baby B

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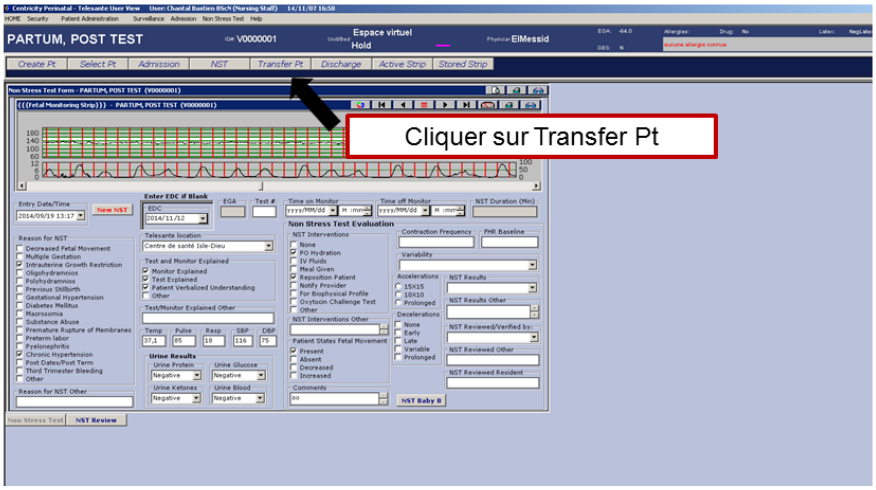
Libération et enregistrement dans espace virtuel

- Le lit actif virtuel doit être libéré pour la prochaine patiente
- L'espace virtuel contient toutes les informations des patientes inscrites dans la base de données spécifique aux sites du RUIS McGill (sauf le CUSM), et ce jusqu'à la période postpartum
- Une fois la période postpartum complétée, les données de la patiente pour cette grossesse seront automatiquement archivées

www.cvsss.ca 58 TÉLÉSANTÉ RUIS McGill

Transfert du lit actif virtuel à l'espace virtuel

1

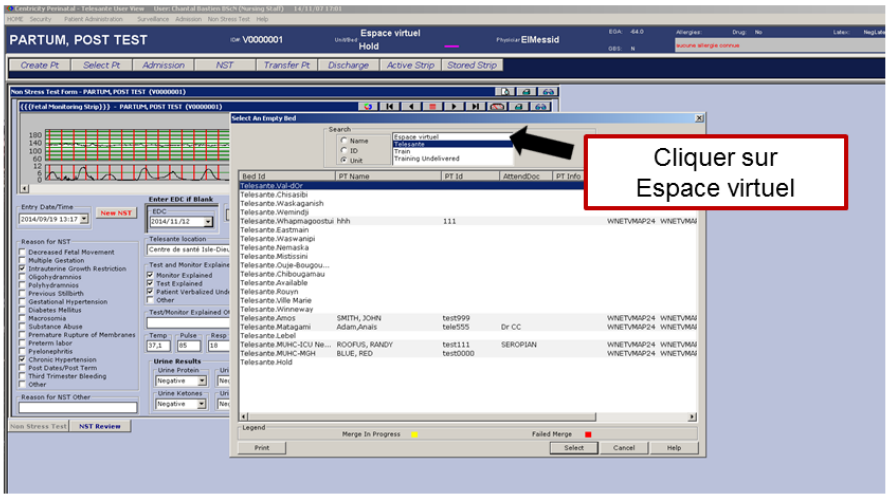


www.cvsss.ca 59

TÉLÉSANTÉ RUIS McGill

Transfert du lit actif virtuel à l'espace virtuel

2

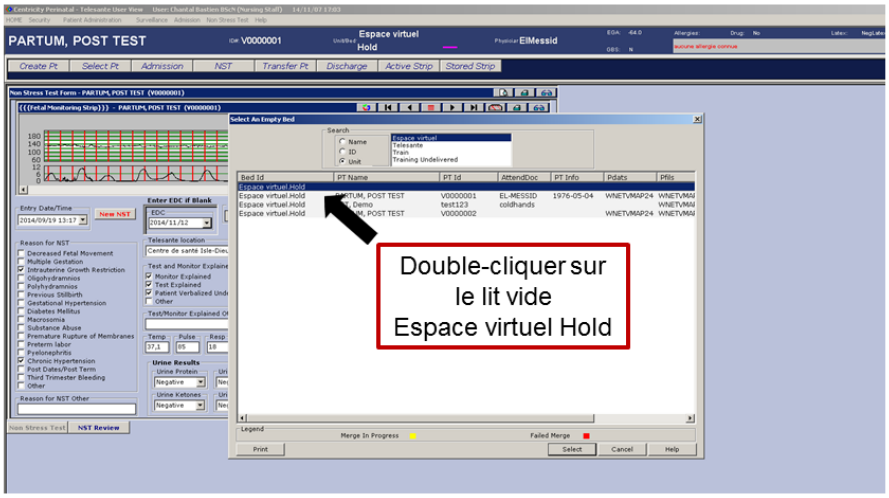


www.cvsss.ca 60

TÉLÉSANTÉ RUIS McGill

Transfert du lit actif virtuel à l'espace virtuel

3

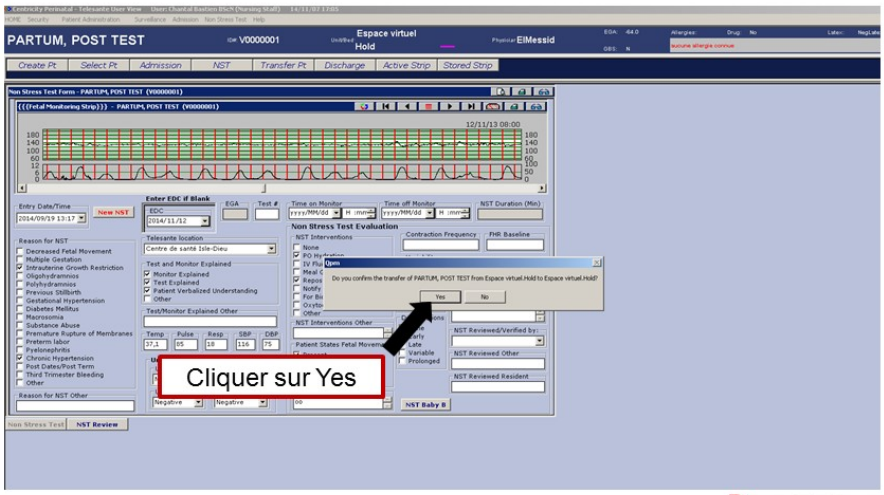


www.cvsss.ca 61

TÉLÉSANTÉ RUIS McGill

Transfert du lit actif virtuel à l'espace virtuel

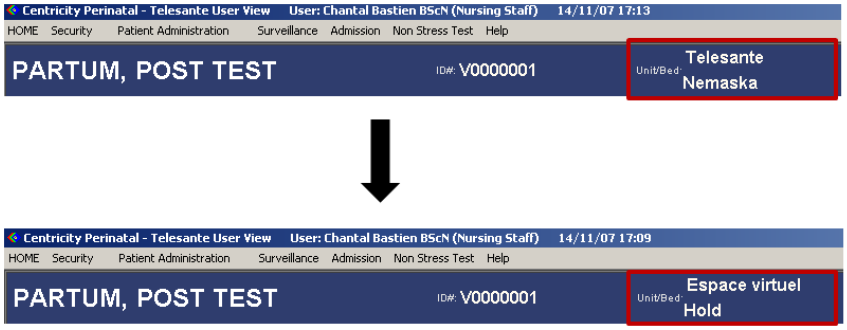
4



www.cvsss.ca 62

TÉLÉSANTÉ RUIS McGill

Double vérification



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4. Visualisation et interprétation du tracé TRF / Ouverture de dossier

Site fournisseur

www.cvsss.ca 64 TÉLÉSANTÉ RUIS McGill

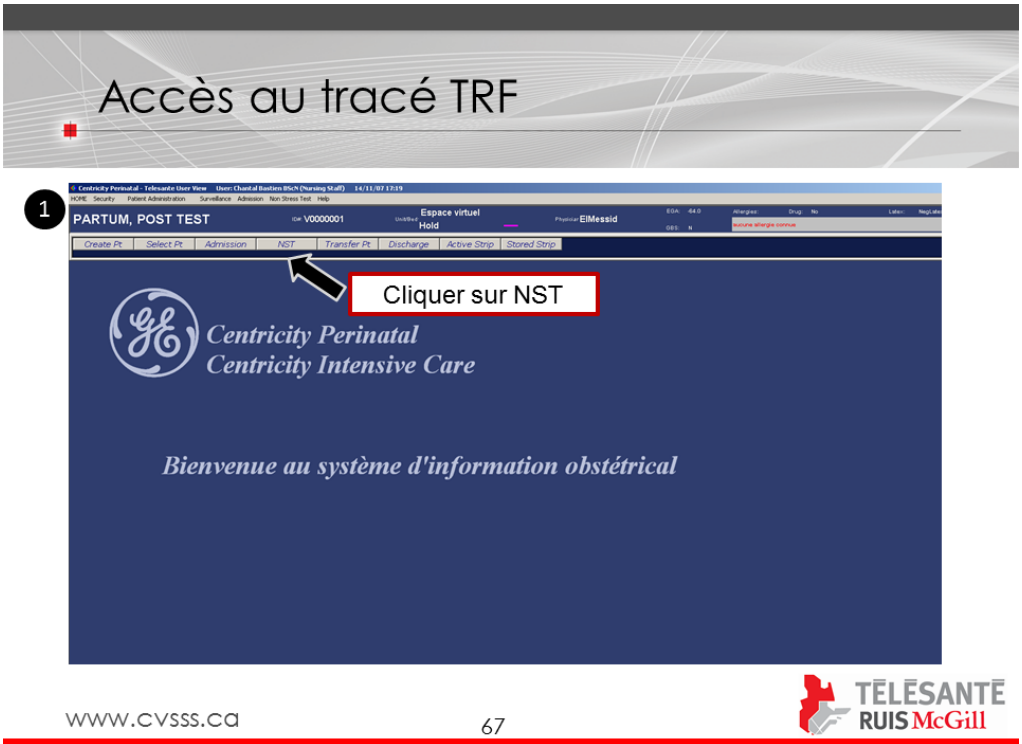
Information préalable : Icônes de lecture du tracé de TRF

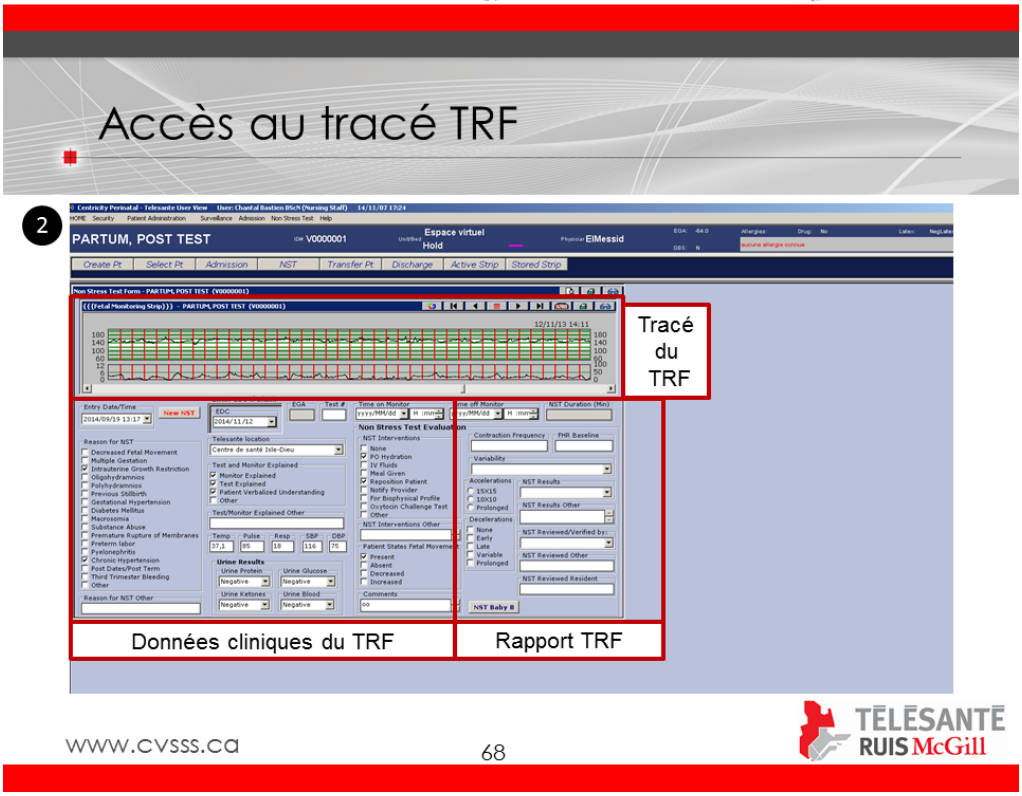
Icône	Fonction
	Lecture des annotations d'épisode, de statut, et de temps
	Déplacement au début du tracé – *données plus anciennes*
	Défilement vers le début du tracé – *de gauche à droite vers les données plus anciennes*
	Arrêt du défilement – *note : double-cliquer sur le tracé arrête aussi le défilement*
	Défilement vers la fin du tracé – *de droite à gauche vers les données plus récentes*
	Déplacement à la fin du tracé – *données plus anciennes*
	Réglage libre de la vitesse de défilement
	Impression du tracé
	Historique des annotations

Actions au site fournisseur

- Sélectionner la patiente identifiée par le site demandeur – ***voir les pages 23 à 29***
- Toujours s'assurer que le nom de la patiente sélectionnée apparaît dans le bandeau en haut de l'écran
- Sélectionner le tracé TRF correspondant à la date et l'heure indiquée par le site demandeur

Nota : Les tracés TRF pour une grossesse sont tous enregistrés, un à la suite de l'autre

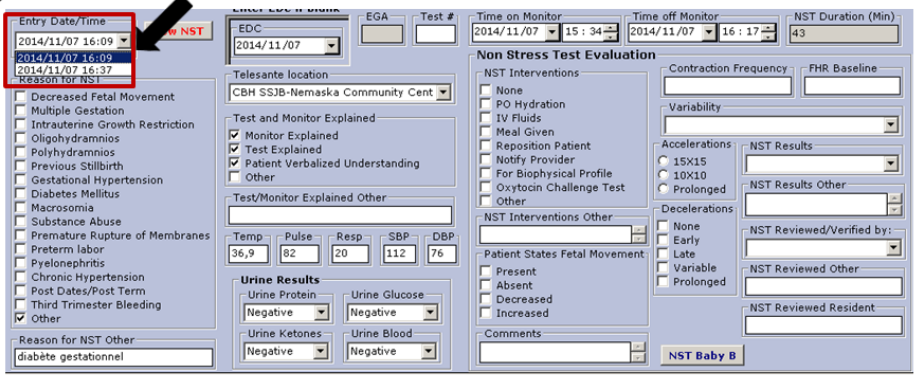

Accès au tracé TRF
1
PARTUM, POST TEST
Espace virtuel
Hold
Create Pt
Select Pt
Admission
NST
Transfer Pt
Discharge
Active Strip
Stored Strip
Cliquer sur NST
Centricity Perinatal
Centricity Intensive Care
Bienvenue au système d'information obstétrical
www.cvsss.ca
67
TÉLÉSANTÉ
RUIS McGill


Accès au tracé TRF
2
PARTUM, POST TEST
Espace virtuel
Hold
Tracé du TRF
Données cliniques du TRF
Rapport TRF
www.cvsss.ca
68
TÉLÉSANTÉ
RUIS McGill

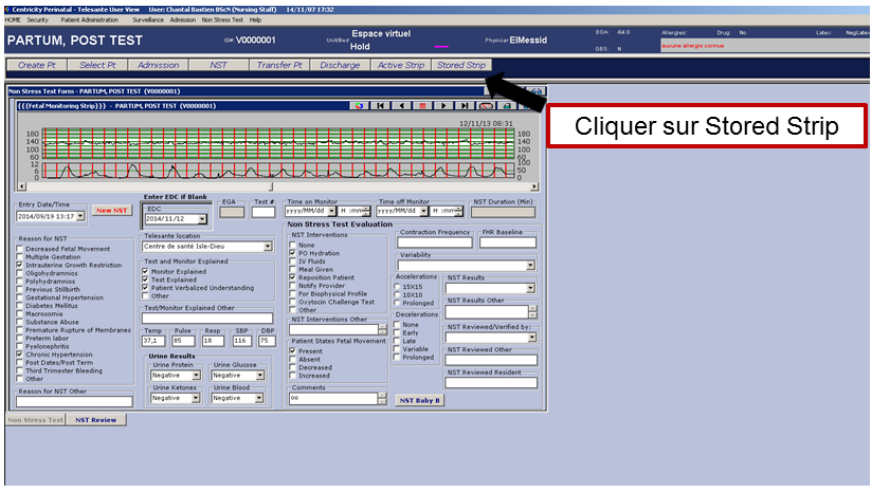
Accès et sélection du tracé du TRF

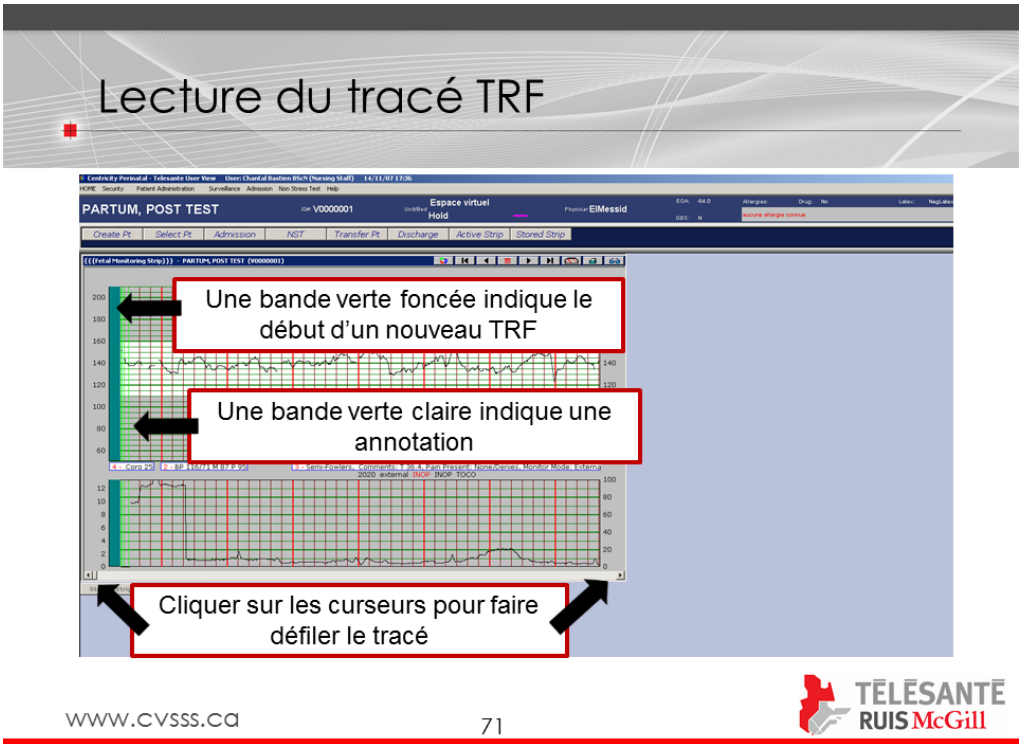
3

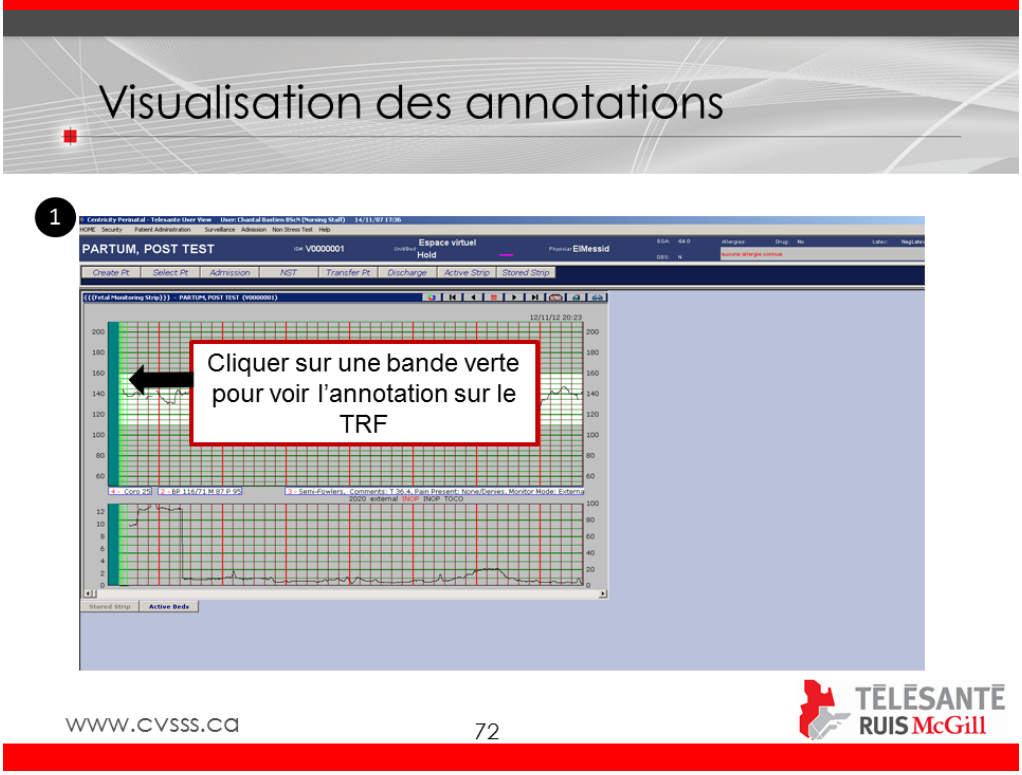
Cliquer sur la flèche du menu déroulant et sélectionner le TRF désiré

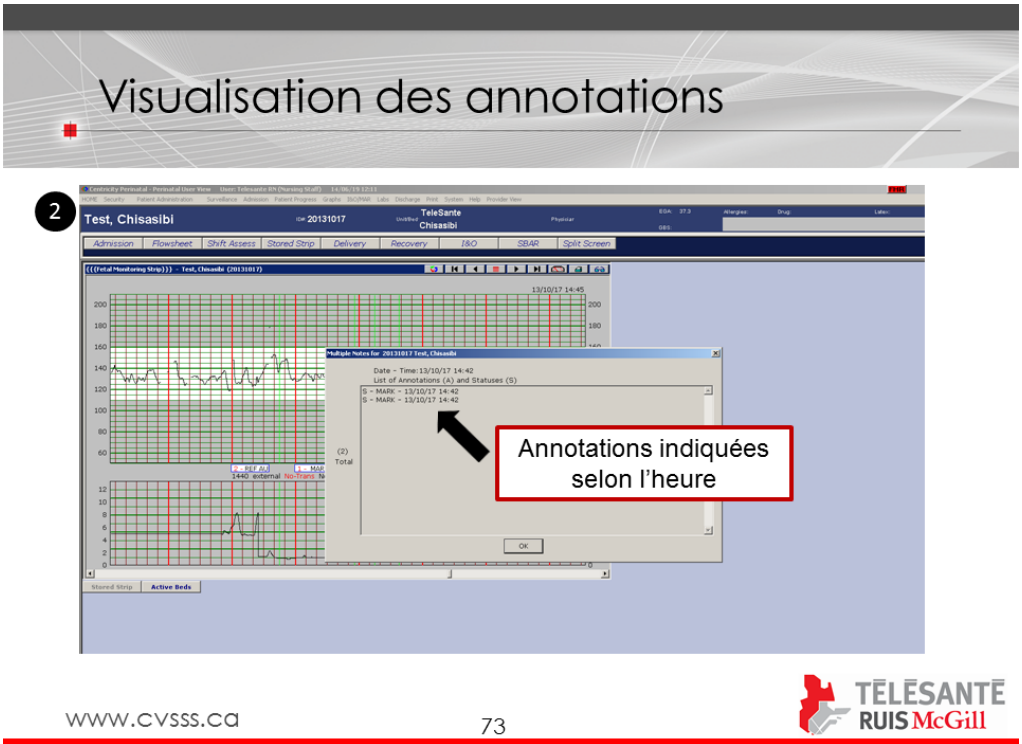


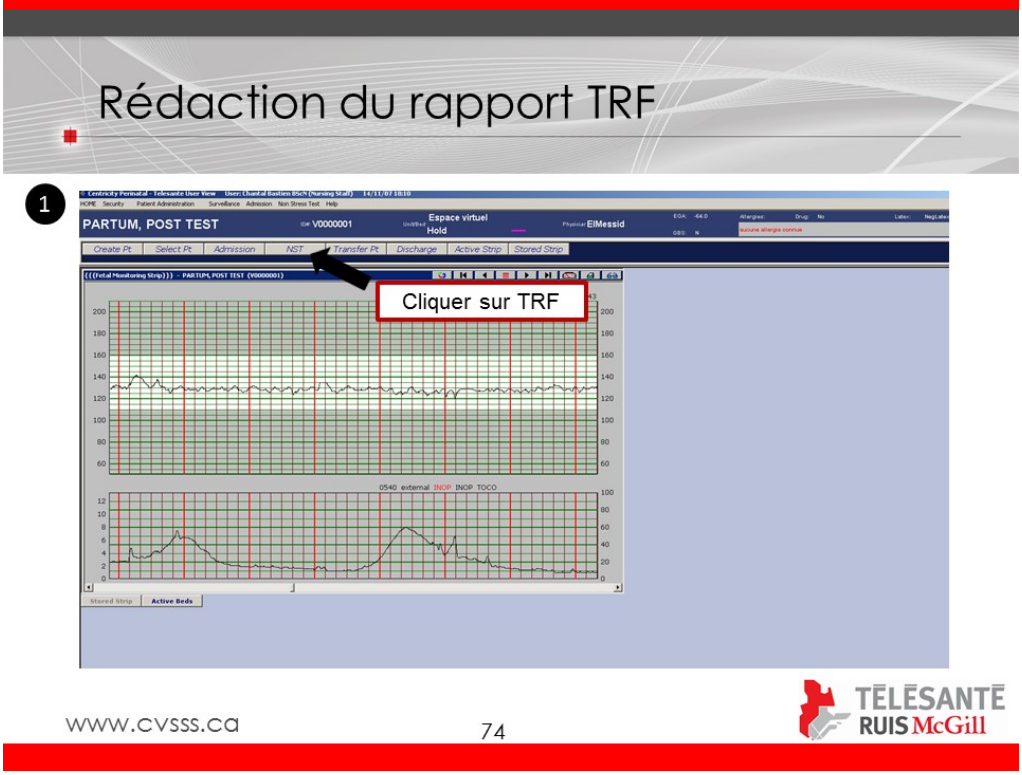
Visualisation des données cliniques

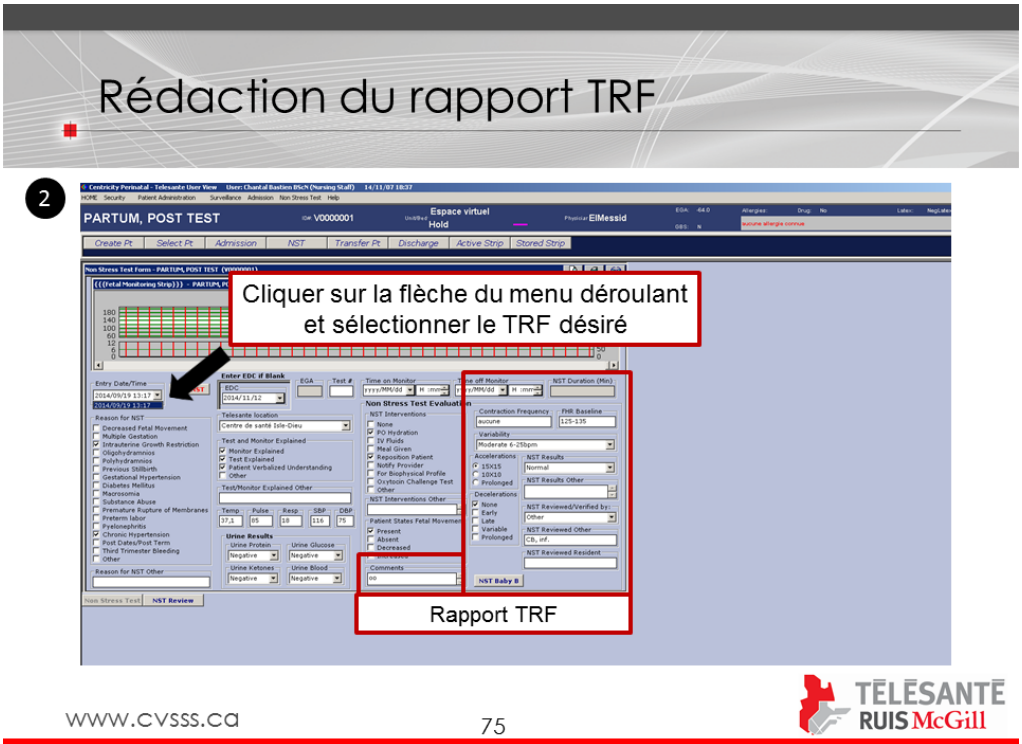


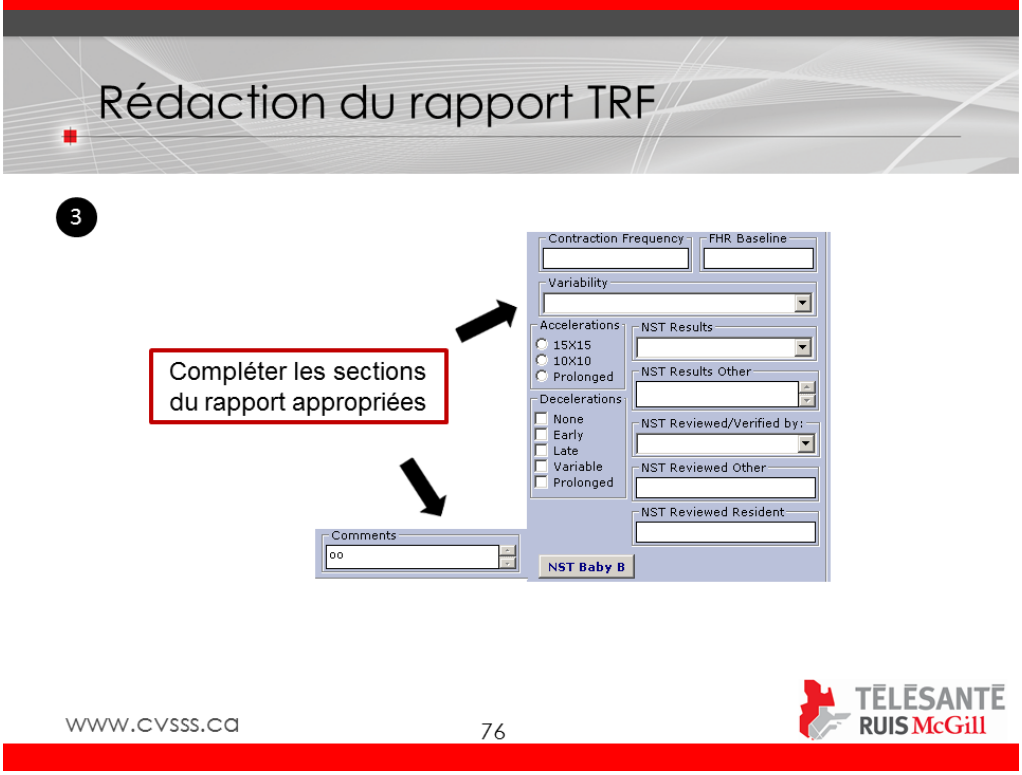

Lecture du tracé TRF
PARTUM, POST TEST
Une bande verte foncée indique le début d'un nouveau TRF
Une bande verte claire indique une annotation
Cliquer sur les curseurs pour faire défiler le tracé
www.cvsss.ca
71
TÉLÉSANTÉ RUIS McGill


Visualisation des annotations
1
PARTUM, POST TEST
Cliquer sur une bande verte pour voir l'annotation sur le TRF
www.cvsss.ca
72
TÉLÉSANTÉ RUIS McGill


Visualisation des annotations
2
Test, Chisasibi
Annotations indiquées selon l'heure
www.cvsss.ca
73
TÉLÉSANTÉ RUIS McGill

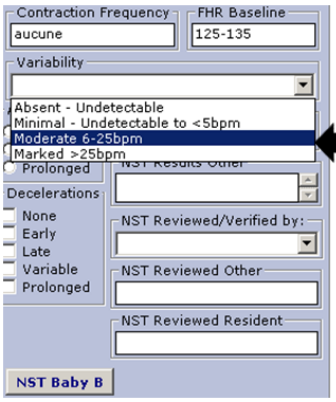

Rédaction du rapport TRF
1
PARTUM, POST TEST
Cliquer sur TRF
www.cvsss.ca
74
TÉLÉSANTÉ RUIS McGill


Rédaction du rapport TRF
2
PARTUM, POST TEST
Cliquer sur la flèche du menu déroulant et sélectionner le TRF désiré
Rapport TRF
www.cvsss.ca
75
TÉLÉSANTÉ RUIS McGill

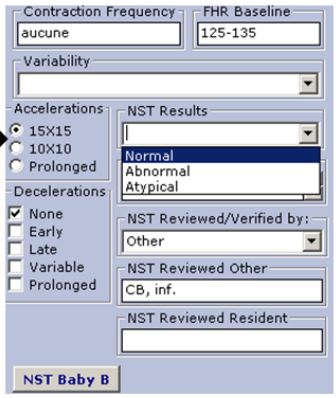

Rédaction du rapport TRF
3
Compléter les sections du rapport appropriées
Contraction Frequency
FHR Baseline
Variability
Accelerations
15X15
10X10
Prolonged
NST Results
NST Results Other
Decelerations
None
Early
Late
Variable
Prolonged
NST Reviewed/Verified by:
NST Reviewed Other
NST Reviewed Resident
Comments
NST Baby B
www.cvsss.ca
76
TÉLÉSANTÉ RUIS McGill

Menus du rapport TRF

4

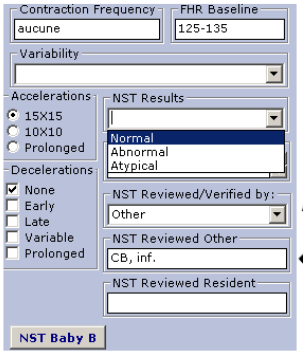


Compléter les champs et cliquer sur la sélection appropriée



Signature du rapport

5

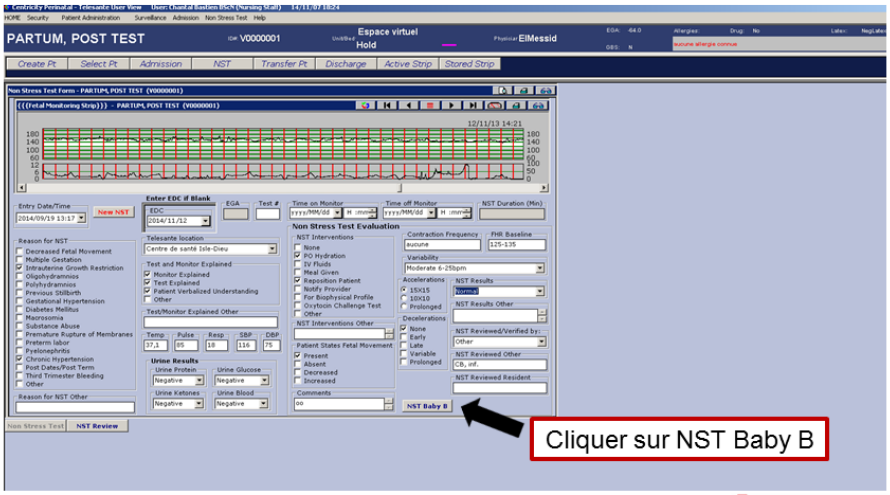


Médecins
Inscrire votre nom pour valider le rapport final et cliquer sur Yes dans la fenêtre qui s'ouvre en quittant la page

Infirmières
Inscrire votre nom pour le rapport préliminaire

Rapport du TRF – si jumeau

1

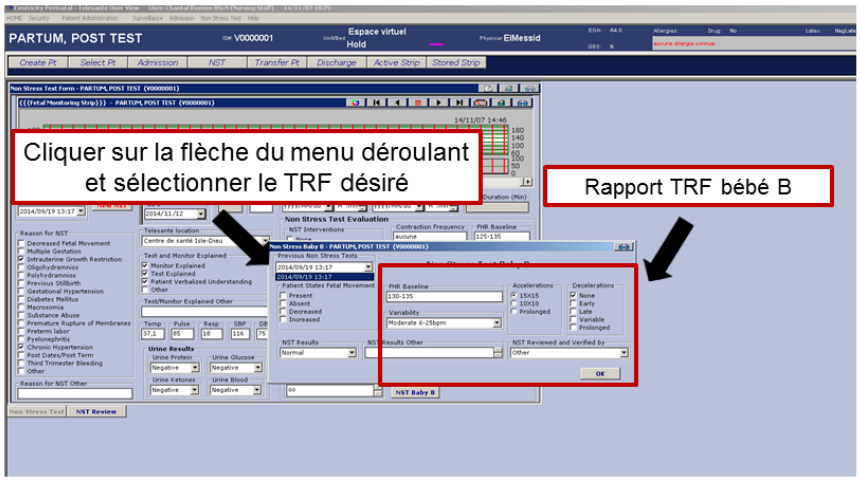


www.cvsss.ca 79

TÉLÉSANTÉ RUIS McGill

Rapport du TRF – si jumeau

2



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TÉLÉSANTÉ RUIS McGill

Menus du rapport TRF – si jumeau

3

Non Stress Baby B - PARTUM, POST TEST (V0000001)

Previous Non Stress Tests: 2014/09/19 13:17

Non Stress Test Baby B

Patient States Fetal Movement: Present, Absent, Decreased, Increased

FHR Baseline: 130-135

Variability: Moderate 6-25bpm (Absent - Undetectable; Minimal - Undetectable to <5bpm; Moderate 6-25bpm; Marked >25bpm)

Accelerations: 15X15, 10X10, Prolonged

Decelerations: None, Early, Late, Variable, Prolonged

NST Results: Normal (Normal, Abnormal, Atypical)

NST Results Other

NST Reviewed and Verified by: Other

OK

Compléter les champs et cliquer sur la sélection appropriée

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TÉLÉSANTÉ RUIS McGill

Signature et validation – si jumeau

4

Non Stress Baby B - PARTUM, POST TEST (V0000001)

Previous Non Stress Tests: 2014/09/19 13:17

Non Stress Test Baby B

Patient States Fetal Movement: Present, Absent, Decreased, Increased

FHR Baseline: 130-135

Variability: Moderate 6-25bpm

Accelerations: 15X15, 10X10, Prolonged

Decelerations: None, Early, Late, Variable, Prolonged

NST Results: Normal

NST Results Other: CB, inf.

NST Reviewed and Verified by: Other

OK

Infirmières
Inscrire votre nom pour le rapport préliminaire

Médecins
Inscrire votre nom pour valider le rapport final et cliquer sur Yes dans la fenêtre qui s'ouvre en quittant la page

NST Reviewed/Verified by:

EXITING FORM: The value which was entered is not a valid choice. Do you want to save this as text?

Yes No

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TÉLÉSANTÉ RUIS McGill

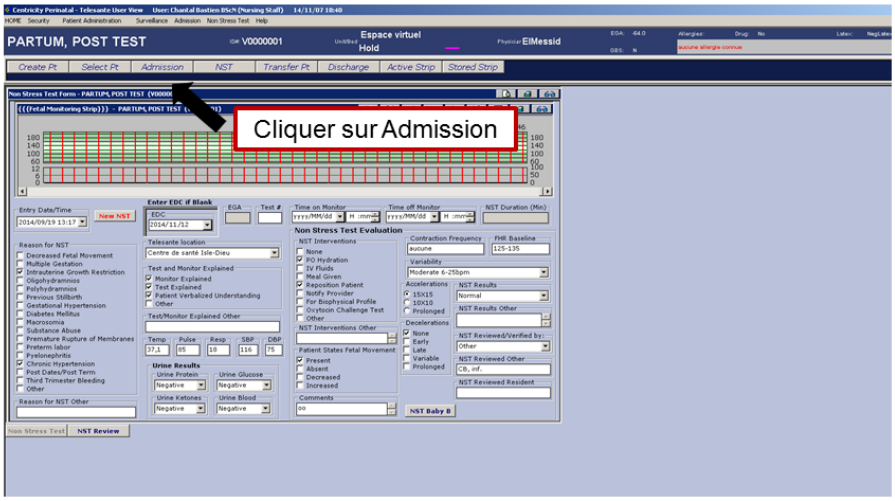
5. Impression

Étapes préliminaires d'impression

- Suivre les instructions les pages 23 à 29 pour la sélection de la patiente
- Une fois la patiente sélectionnée, imprimer les rapports désirés :
  - Documents d'ouverture de dossier
    - Document d'admission
    - Données démographiques
  - Rapport TRF
  - Tracé TRF

Impression – Document d'admission

1

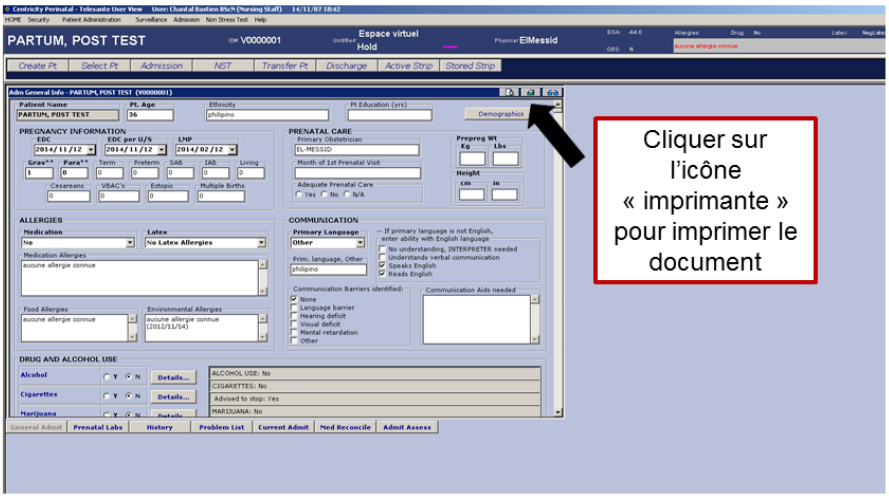


www.cvsss.ca 85

TÉLÉSANTÉ RUIS McGill

Impression - Document d'admission

2



www.cvsss.ca 86

TÉLÉSANTÉ RUIS McGill

Exemple de document d'admission

McGill University Health Centre
687, av. des Pins
Montréal QC H3A 1A1

Print Date & Time: 2014/11/10 09:59
Printed by: Chantal Bastien BSCN

PARTUM, POST TEST
MR#: V0000001
RAMQ#: PABP760504
DOB: 1976/05/04 Age: 36
Unit: Espace virtuel Bed: Hold
Attending: EL-MESSID

Admission Record

Page: 1

Pregnancy Information

G/ | P/ 0 T/ 0 PM/ 0 SAB/ 0 IAB/ 0 L/ 0

EDC: 14/11/12 LMP: 14/02/12 Cesareans: 0 VBACs: 0 Ectopics: 0 Multiple Births: 0
EDC per Ultrasound: 14/11/12
Primary Obstetrician: EL-MESSID
Month of 1st Prenatal Care:
Adequate Prenatal Care:
Height: (in) (cm)
Weight (pre-pregnancy): (kg) Lbs.

Allergies

Medication Allergies: No aucune allergie connue
Food Allergies: aucune allergie connue
Environmental Allergies: aucune allergie connue (2012/11/14)
Other Allergies: No Latex Allergies

Communication

Primary Language: Other philipino
English Abilities: Speaks English,Reads English
Communication Barriers: None

Demographics

Patient Information

Date of Birth: 1976/05/04 RAMQ:
Address: 1 rue RUE Age: 36
VILLE
Postal Code: H0H 0H0 Home Telephone: (514) 777-7777
Religion: NOT AVAILABLE - NOT SPECIFIED Work Telephone:
Ethnicity: philipino Education (yrs):
Marital Status: MARRIED ADULT Occupation:

Next of Kin Information

Emergency Contact Name: Partum, Pre Test Emer Contact Telephone: (514)999-9999
Emer Contact Relationship: Soeur

Next of Kin Information

Next of Kin Name: Next of Kin Telephone:
Next of Kin Relationship:

Alcohol/Smoking/Drug Use

Alcohol Use: No
Cigarette Use: No
Advised to Stop Smoking: Yes
Marijuana Use: No
Cocaine Use: No
Other Illicit Drugs: No

Labs (Latest Result Summary)

Blood Type: A Positive Rho(G) this pregnancy: Yes
Antibody Screen: Positive
Hemoglobin/Hematocrit/MCV: / / Gonorrhea: Unknown
Rubella/Titer: Chlamydia:
Hepatitis B: RPR/VDRL:
Group Beta Strep: Negative
ANNOTATIONS:
DHIS
PPD: HIV+ Exposure:
Varicella/Titer: HIV+ Results:
Pap Test:

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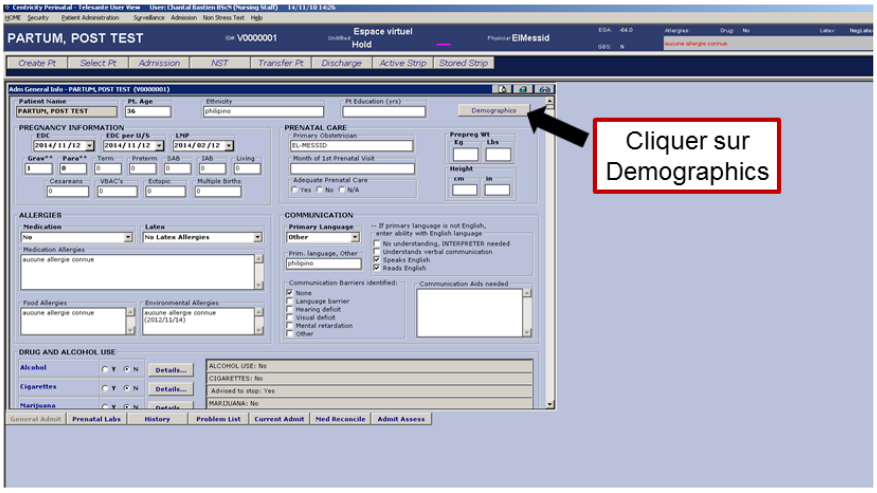
TÉLÉSANTÉ RUIS McGill

Impression – Données démographiques

1

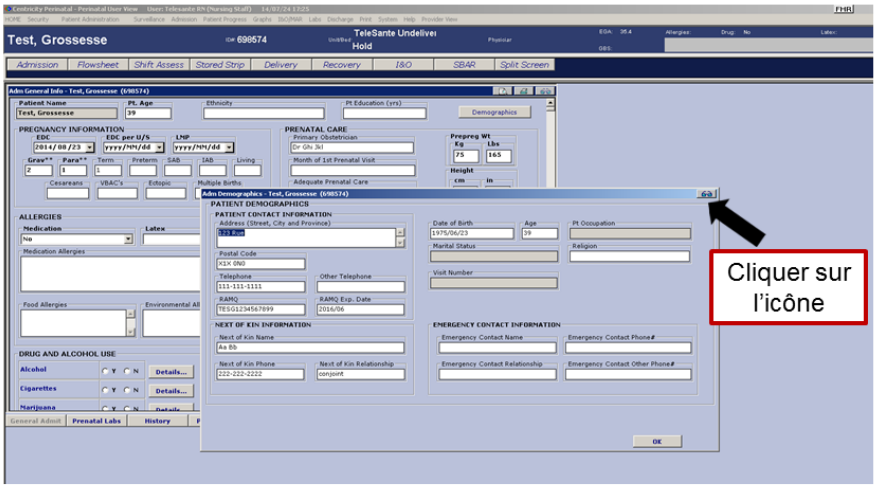


www.cvsss.ca 88

TÉLÉSANTÉ RUIS McGill

Impression – Données démographiques

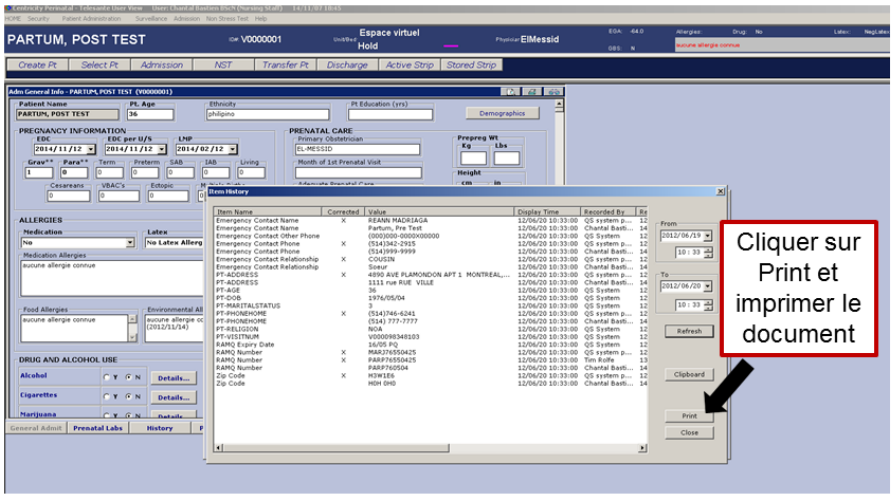
2



TÉLÉSANTÉ RUIS McGill

Impression – Données démographiques

3



TÉLÉSANTÉ RUIS McGill

Exemple de document de données démographiques

McGill University Health Centre
687, av. des Pins
Montréal QC H3A 1A1

Print Date & Time: 2014/11/10 10:09
Printed By: Chantal Bastien BScN

Audit Trail Print

PARTUM, POST TEST
MR# : **V0000001**
RAMQ# : **PARP760504**
DOB: 1976/05/04
Unit: Espace virtuel
Attending: EL-MESSID
Age 36
Bed: Hold

Item Name	Corrected	Value	Display Time	Recorded By	Record Time	Annotation	Corrected By	Corrected Time
Emergency Contact Name	X	REANN MADRIAGA	12/06/20 10:33:00	QS system process	12/06/20 10:32:11		Chantal Bastien BScN	14/11/07 15:38:45
Emergency Contact Name		Partum, Pre Test	12/06/20 10:33:00	Chantal Bastien BScN	14/11/07 15:38:45			
Emergency Contact Other Phone		(000)000-0000X00000	12/06/20 10:33:00	QS System	12/06/20 10:32:11			
Emergency Contact Phone	X	(514)342-2915	12/06/20 10:33:00	QS system process	12/06/20 10:32:11			
Emergency Contact Phone		(514)999-9999	12/06/20 10:33:00	Chantal Bastien BScN	14/11/07 15:38:51			
Emergency Contact Relationship	X	COUSIN	12/06/20 10:33:00	QS system process	12/06/20 10:32:11			
Emergency Contact Relationship		Soeur	12/06/20 10:33:00	Chantal Bastien BScN	14/11/07 15:40:06			
PT-ADDRESS	X	4890 AVE PLAMONDON APT 1 MONTREAL, PQ	12/06/20 10:33:00	QS system process	12/06/20 10:32:11			
PT-ADDRESS		1111 rue RUE VILLE	12/06/20 10:33:00	Chantal Bastien BScN	14/11/07 15:37:26			
PT-AGE		36	12/06/20 10:33:00	QS System	12/06/20 10:32:11			
PT-DOB		1976/05/04	12/06/20 10:33:00	QS System	12/06/20 10:32:10			
PT-MARITALSTATUS		3	12/06/20 10:33:00	QS System	12/06/20 10:32:11			

Print Requested by: Chantal Bastien BScN Date Printed : 2014/11/10 10:09

McGill University Health Centre
687, av. des Pins
Montréal QC H3A 1A1

Print Date & Time: 2014/11/10 10:09
Printed By: Chantal Bastien BScN

Audit Trail Print

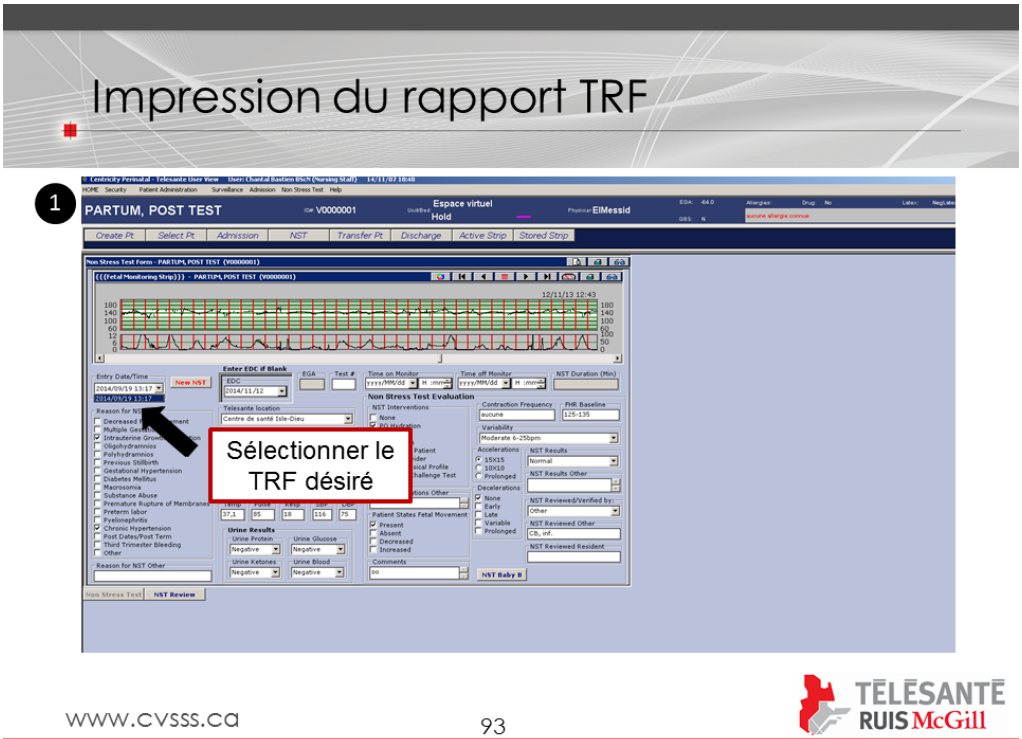
PARTUM, POST TEST
MR# : **V0000001**
RAMQ# : **PARP760504**
DOB: 1976/05/04
Unit: Espace virtuel
Attending: EL-MESSID
Age 36
Bed: Hold

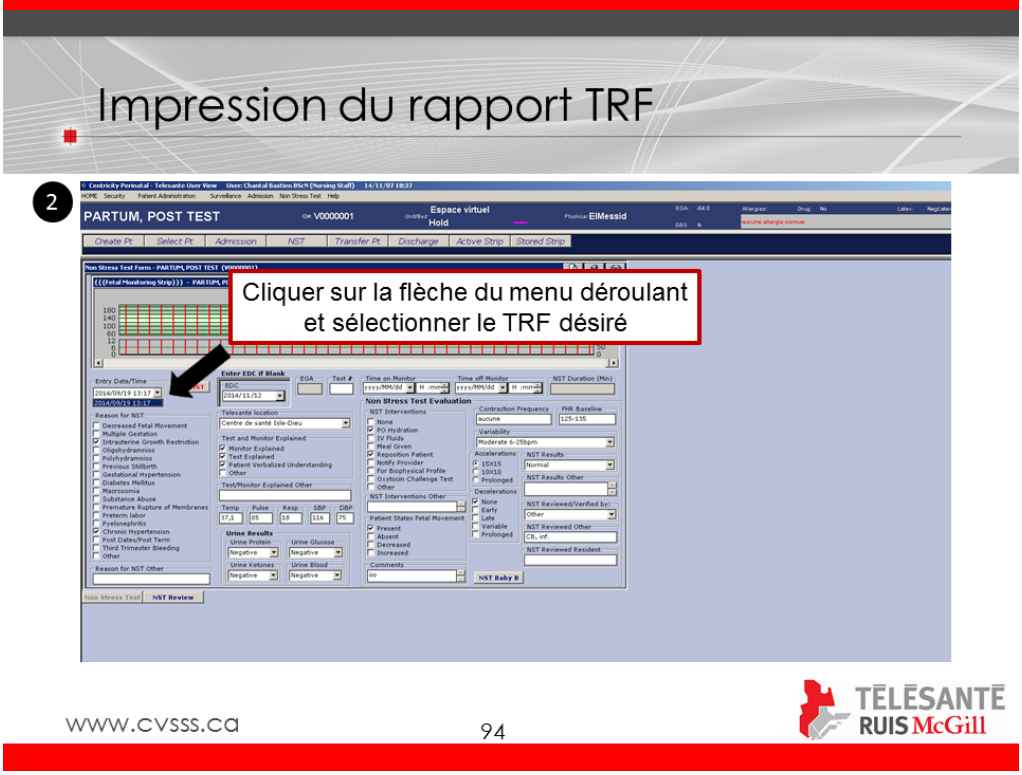
Item Name	Corrected	Value	Display Time	Recorded By	Record Time	Annotation	Corrected By	Corrected Time
PT-PHONEHOME	X	(514)746-6241	12/06/20 10:33:00	QS system process	12/06/20 10:32:11		Chantal Bastien BScN	14/11/07 15:37:42
PT-PHONEHOME		(514) 777-7777	12/06/20 10:33:00	Chantal Bastien BScN	14/11/07 15:37:42			
PT-RELIGION		NOA	12/06/20 10:33:00	QS System	12/06/20 10:32:11			
PT-VISITNUM		V000098348103	12/06/20 10:33:00	QS System	12/06/20 10:32:10			
RAMQ Expiry Date		16/05 PQ	12/06/20 10:33:00	QS System	12/06/20 10:32:11			
RAMQ Number	X	MARJ765S0425	12/06/20 10:33:00	QS system process	12/06/20 10:32:11		Tim Rolfe	13/08/12 11:41:23
RAMQ Number	X	PARP765S0425	12/06/20 10:33:00	Tim Rolfe	13/08/12 11:41:23		Chantal Bastien BScN	14/11/07 15:38:14
RAMQ Number		PARP760S04	12/06/20 10:33:00	Chantal Bastien BScN	14/11/07 15:38:14			
Zip Code	X	H3W1E6	12/06/20 10:33:00	QS system process	12/06/20 10:32:11		Chantal Bastien BScN	14/11/07 15:37:36
Zip Code		H0H 0H0	12/06/20 10:33:00	Chantal Bastien BScN	14/11/07 15:37:36			

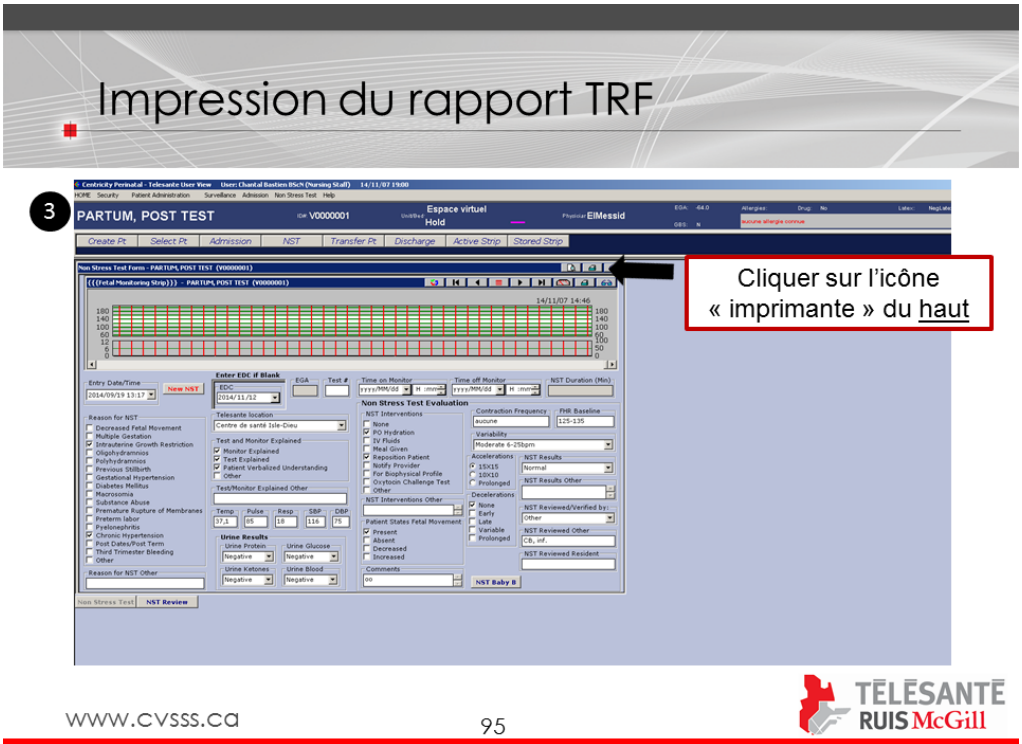
Print Requested by: Chantal Bastien BScN Date Printed : 2014/11/10 10:09 Page Page 2 (EOD)

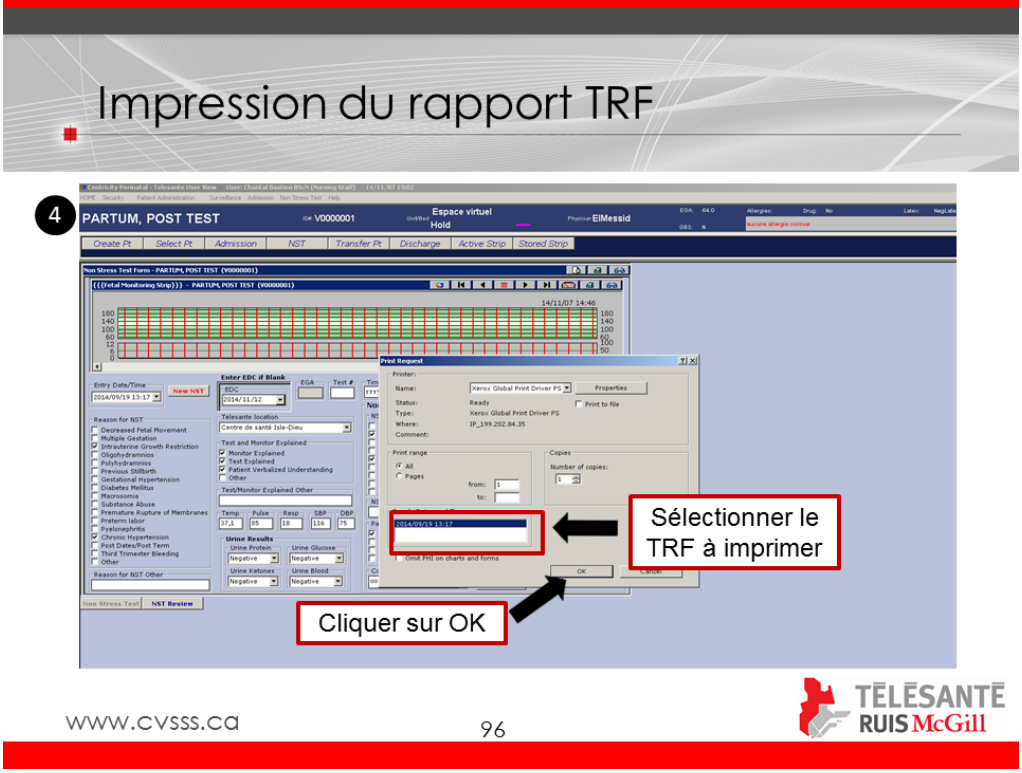
Impression du rapport et du tracé TRF

- Rapport TRF : Il doit être imprimé et inclus au dossier-patient
- Tracé TRF :
  - Site demandeur
    - La copie papier du moniteur fœtal doit obligatoirement être conservée au dossier de la patiente
  - Site fournisseur
    - La copie électronique de CPN doit être imprimée et conservée au dossier de la patiente

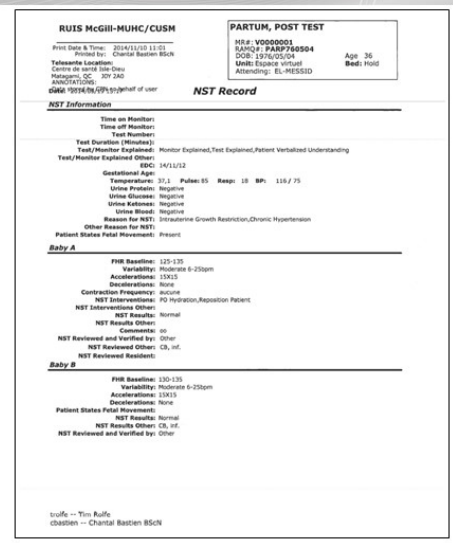

Impression du rapport TRF
1
PARTUM, POST TEST
Sélectionner le TRF désiré
www.cvsss.ca
93
TÉLÉSANTÉ RUIS McGill


Impression du rapport TRF
2
PARTUM, POST TEST
Cliquer sur la flèche du menu déroulant et sélectionner le TRF désiré
www.cvsss.ca
94
TÉLÉSANTÉ RUIS McGill


Impression du rapport TRF
3
PARTUM, POST TEST
Cliquer sur l'icône « imprimante » du haut
www.cvsss.ca
95
TÉLÉSANTÉ RUIS McGill


Impression du rapport TRF
4
PARTUM, POST TEST
Sélectionner le TRF à imprimer
Cliquer sur OK
www.cvsss.ca
96
TÉLÉSANTÉ RUIS McGill

Exemple de rapport TRF



RUIS McGill-MUHC/CUSM

Print Date & Time: 2014/11/10 11:01
Printed by: Chantal Bastien BScN
Telesante Location:
Centre de santé Isle-Dieu
Matagami, QC J0Y 2A0
ANNOTATIONS:
Date: 2014/11/10 11:01
Printed by: Chantal Bastien BScN on behalf of user

PARTUM, POST TEST
MR #: V0000001
RAMQ#: PARP760504
DOB: 1976/05/04 Age 36
Unit: Espace virtuel Bed: Hold
Attending: EL-MESSID

NST Record

NST Information
Time on Monitor:
Time off Monitor:
Test Number:
Test Duration (Minutes):
Test/Monitor Explained: Monitor Explained,Test Explained,Patient Verbalized Understanding
Test/Monitor Explained Other:
EDC: 14/11/12
Gestational Age:
Temperature: 37,1 Pulse: 85 Resp: 18 BP: 116 / 75
Urine Protein: Negative
Urine Glucose: Negative
Urine Ketones: Negative
Urine Blood: Negative
Reason for NST: Intrauterine Growth Restriction,Chronic Hypertension
Other Reason for NST:
Patient States Fetal Movement: Present

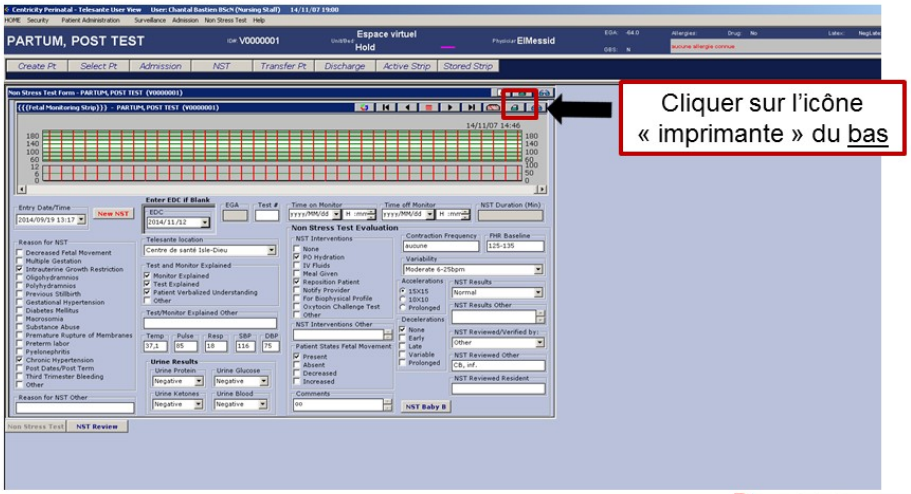
Baby A
FHR Baseline: 125-135
Variability: Moderate 6-25bpm
Accelerations: 15X15
Decelerations: None
Contraction Frequency: aucune
NST Interventions: PO Hydration,Reposition Patient
NST Interventions Other:
NST Results: Normal
NST Results Other:
Comments: oo
NST Reviewed and Verified by: Other
NST Reviewed Other: Cb, inf.
NST Reviewed Resident:

Baby B
FHR Baseline: 130-135
Variability: Moderate 6-25bpm
Accelerations: 15X15
Decelerations: None
Patient States Fetal Movement:
NST Results: Normal
NST Results Other: Cb, inf.
NST Reviewed and Verified by: Other

trolfe -- Tim Rolfe
cbastien -- Chantal Bastien BScN

Impression du tracé TRF

1



Cliquer sur l'icône « imprimante » du bas

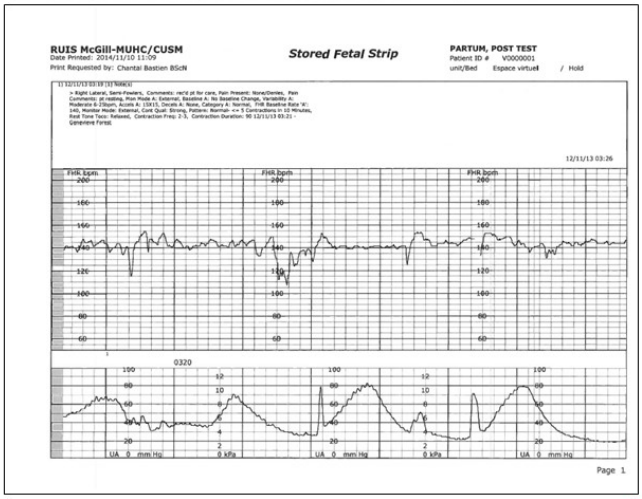
Impression du tracé TRF

2

Sélectionner l'intervalle de temps du tracé TRF à imprimer

Cliquer sur OK

Exemple d'impression d'un tracé TRF



Impression des annotations d'un tracé TRF

1

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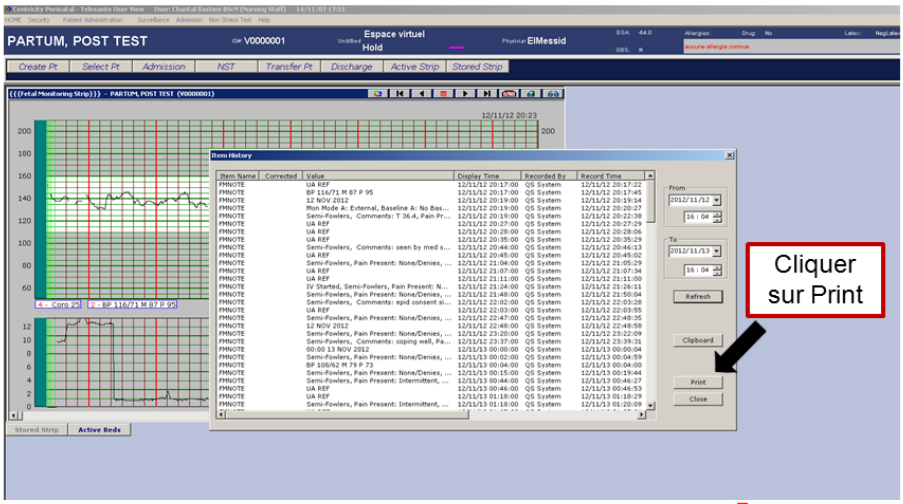
TÉLÉSANTÉ RUIS McGill

Impression des annotations

2



www.cvsss.ca 102

TÉLÉSANTÉ RUIS McGill

Exemple de rapport d'annotations

McGill University Health Centre
687, av. des Pins
Montréal QC H3A 1A1

Print Date & Time: 2014/11/10 09:44
Printed by: Chantal Bastien BScN

Audit Trail Print

PARTUM, POST TEST
MR#: **V0000001**
RAMQ#: **PARP760504**
DOB: 1976/05/04
Unit: Espace virtuel
Attending: **EL-MESSID**
Age 36
Bed: Hold

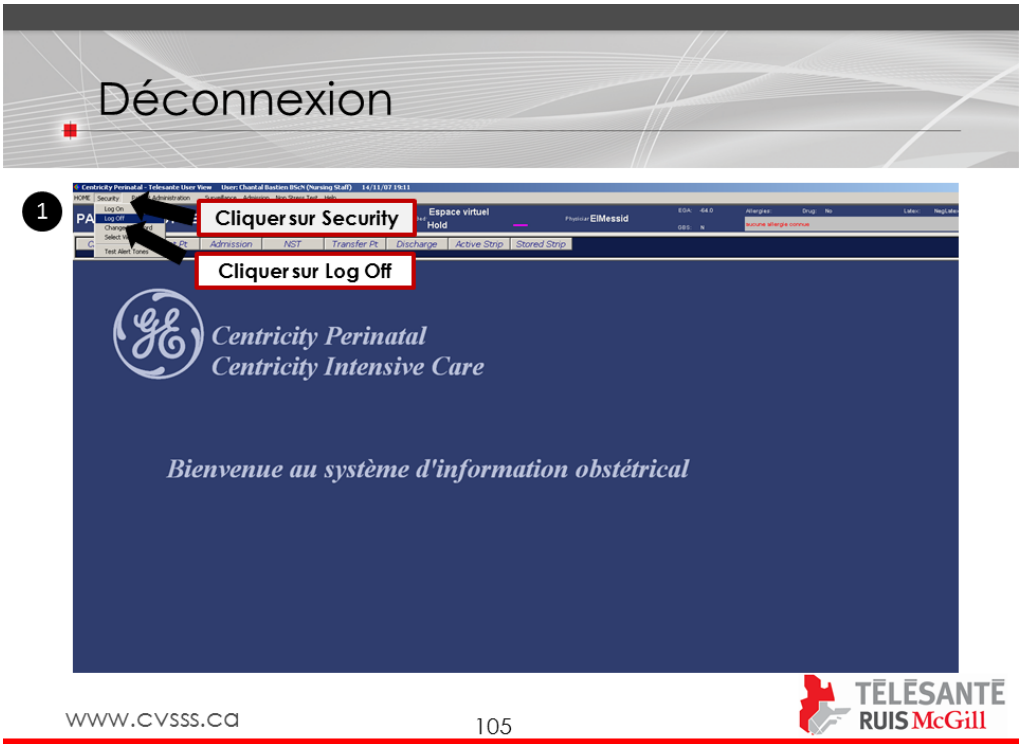
Item Name	Corrected	Value	Display Time	Recorded By	Record Time	Annotation	Corrected By	Corrected Time
FMNOTE		UA REF	12/11/12 20:17:00	QS System	12/11/12 20:17:22			
FMNOTE		BP 116/71 M 87 P 95	12/11/12 20:17:00	QS System	12/11/12 20:17:45			
FMNOTE		12 NOV 2012	12/11/12 20:19:00	QS System	12/11/12 20:19:14			
FMNOTE		Mon Mode A: External, Baseline A: No Baseline Change, Variability A: Moderate 6-25bpm, Decels A: None, Category A: Normal, FHR Baseline Rate 'A' 140-150 12/11/12 20:20 - Josianne Fournier BScN	12/11/12 20:19:00	QS System	12/11/12 20:20:27			
FMNOTE		Semi-Fowlers, Comments: T 36.4, Pain Present: None/Denies, Monitor Mode: External, Contraction Freq: none, Stage of Preg.: Labor, ROM Status: Intact, Induction, Orient to Room, Call Bell 12/11/12 20:22 - Josianne Fournier BScN	12/11/12 20:19:00	QS System	12/11/12 20:22:38			
FMNOTE		UA REF	12/11/12 20:27:00	QS System	12/11/12 20:27:29			
FMNOTE		UA REF	12/11/12 20:28:00	QS System	12/11/12 20:28:06			
FMNOTE		UA REF	12/11/12 20:35:00	QS System	12/11/12 20:35:29			
FMNOTE								

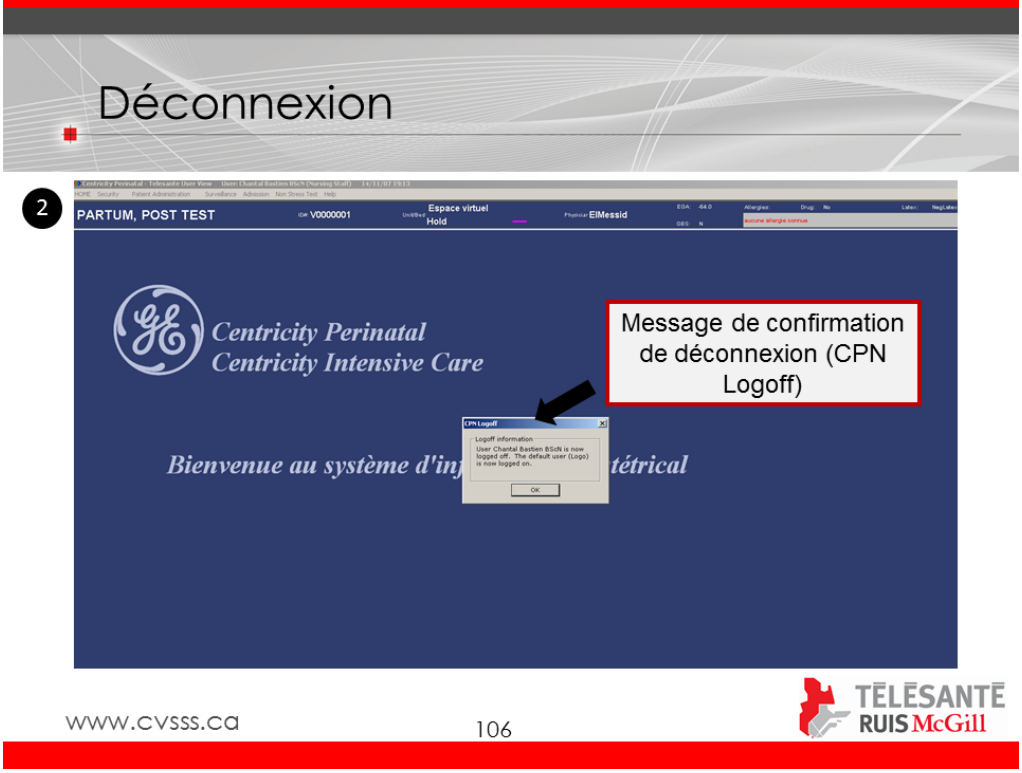
Print Requested by: Chantal Bastien BScN Date Printed : 2014/11/10 09:44 Page Page 1

www.cvsss.ca 103 TÉLÉSANTÉ RUIS McGill

6. Déconnexion

www.cvsss.ca 104 TÉLÉSANTÉ RUIS McGill


Déconnexion
1
Cliquer sur Security
Cliquer sur Log Off
Centricity Perinatal
Centricity Intensive Care
Bienvenue au système d'information obstétrical
www.cvsss.ca
105
TÉLÉSANTÉ
RUIS McGill


Déconnexion
2
PARTUM, POST TEST
Centricity Perinatal
Centricity Intensive Care
Message de confirmation de déconnexion (CPN Logoff)
www.cvsss.ca
106
TÉLÉSANTÉ
RUIS McGill

7. Informations pratiques

Tableau comparatif des TRF

- Il est possible de visualiser une vue comparative des rapports TRF (voir exemple aux trois pages suivantes)
- Rappel : suivre les instructions des pages 23 à 29 pour la sélection de la patiente

Tableau comparatif des TRF

1

Tableau comparatif des TRF

2

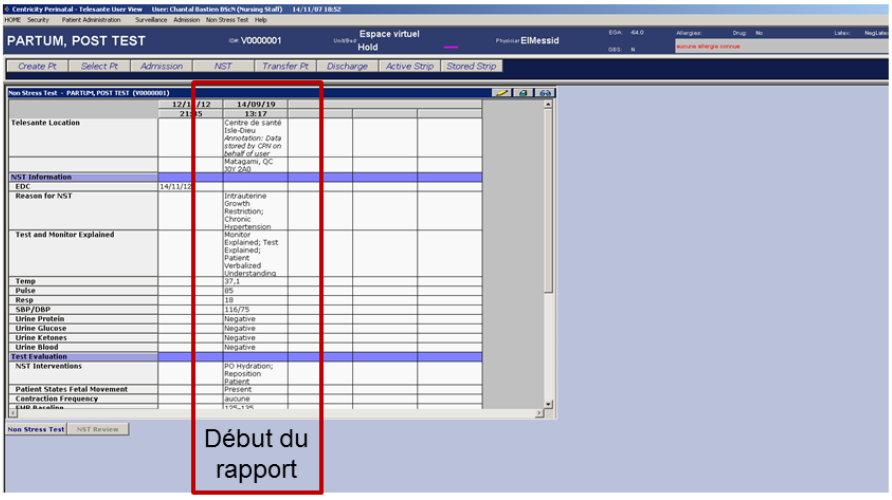


Tableau comparatif des TRF

3

PARTUM, POST TEST

Fin du rapport

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TÉLÉSANTÉ RUIS McGill

Soutien CPN

- Le CECoT est disponible pour du soutien à distance entre 8 h et 16 h les jours ouvrables (voir coordonnées à la page suivante)
- À l'extérieur des heures d'opération du CECoT, communiquer avec l'administrateur de l'ACE sur son téléavertisseur pour des urgences techniques telles un problèmes d'accès à l'application CPN*

* Téléavertisseur de Tim Rolfe, administrateur de l'ACE au CUSM : 514 406-0486
(en cas de problème d'accès à l'application en dehors des heures d'opération du CECoT)

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TÉLÉSANTÉ RUIS McGill

Coordonnées du CECoT

Pour questions ou
informations supplémentaires :

Centre de coordination et d'expertise de télésanté (CECoT)

Téléphone : 514-412-4294 ou 1-877-536-3202 (sans frais au Québec)
Courriel : visio-cusm@muhc.mcgill.ca

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Appendix C

Electronic Fetal Monitor Parameters Informative Guide

LE CENTRE VIRTUEL DE SANTÉ ET DE SERVICES SOCIAUX (CvSSS)

LA TÉLÉSANTÉ SIMPLIFIÉE!

Manuel d'utilisation simplifié
Corometrics 172

Chantal Bastien, BSc(N)
Coordonnatrice clinique CvSSS
Équipe du CECoT

25 août 2014

TÉLÉSANTÉ RUIS McGill

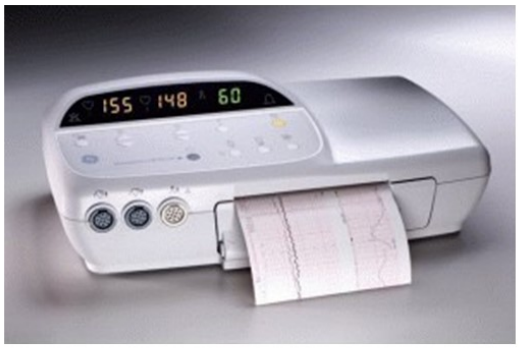
Objectifs de la formation

- Objectifs principaux
  - Présenter sommairement le moniteur fœtal Corometrics 172 et son utilisation
  - Partager les points d'utilisation pertinents à l'application CPN *

* CPN : Centricity Perinatal

Moniteur fœtal Corometrics 172

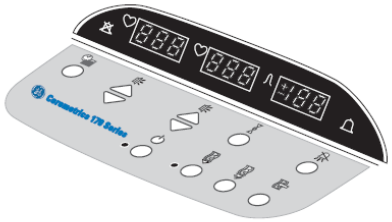
Moniteur fœtal Corometrics 172



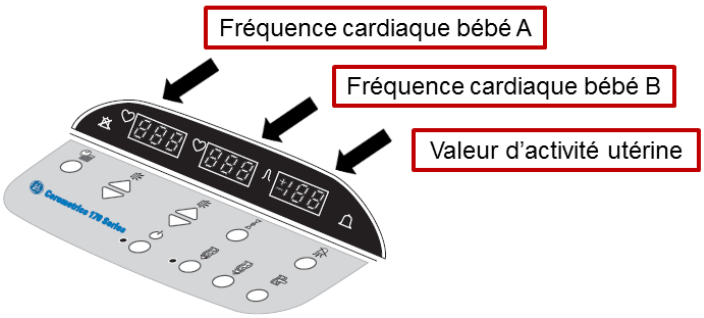
- 2 cardiotransducteurs
- 1 tocotransducteur
- 1 marqueur d'événement

Commandes du panneau avant

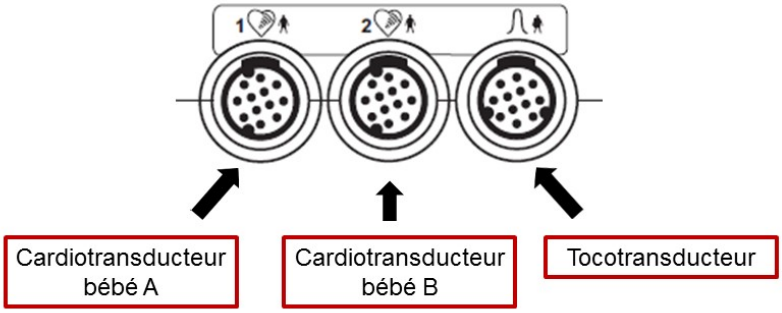
Symbole	Nom
	Alimentation
	Enregistrement
	Déroulement du papier
	Marque/Décalage
	Configuration
	Volume
	Référence AU
	Désactivation d'alarme



Affichages numériques

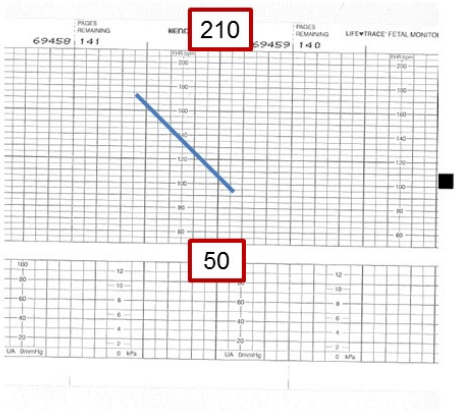


Connecteurs du panneau avant



Points pertinents à Centricity

Échelle de papier



- L'échelle de papier compatible avec CPN est de 50 – 210 battements/minute

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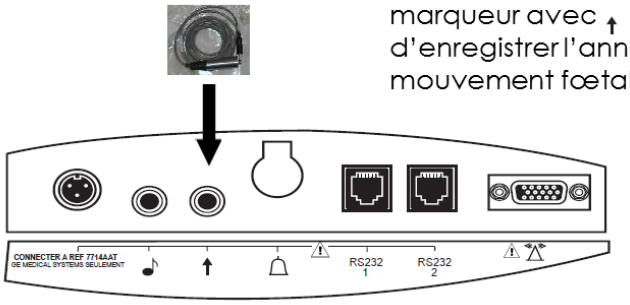
Marqueur d'événement

- Le marqueur d'événement se branche dans le connecteur de marqueur avec ↑ afin d'enregistrer l'annotation de mouvement fœtal dans CPN



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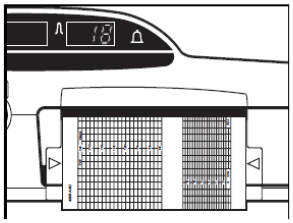
Conservation du TRF dans le dossier patient



- Possibilité d'enregistrer le TRF sur papier et l'insérer au dossier de la patiente
- Possibilité d'imprimer le TRF à partir du logiciel Centricity

Soutien

- Le CECoT est disponible pour du soutien à distance sur semaine entre 8 h et 16 h 30 (jours ouvrables)
- L'entente clinique vous permet un soutien par télésanté pour les urgences avec l'obstétricien de garde du CUSM

Centricity Perinatal

Pour informations supplémentaires

Centre de coordination et d'expertise de télésanté (CECoT)

Téléphone : 514-412-4294 ou 1-877-536-3202 (sans frais au Québec)

Courriel : visio-cusm@muhc.mcgill.ca

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Appendix D

Centricity Perinatal Software Training Program Evaluation Questionnaire

Évaluation

Formateur(s) : Chantal Bastien

Date de la session : _____

Nom : _____

Établissement : _____

1. Évaluation globale de la formation, encerclez (ou cochez) un numéro

Sur une échelle de 1 à 5 :

1. Pas utile du tout
2. Un peu utile
3. Utile
4. Aidant
5. Excellent

2. Évaluation de l'utilité des sujets de formation suivants

1.1 Organisation de la base de données CPN

Pas utile du tout Excellent

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ Sans Objet ☐

1.2 Connexion et gestion des mots de passe

Pas utile du tout Excellent

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ Sans Objet ☐

1.3 Inscription de la patiente et capture du tracé TRF – Site demandeur

Pas utile du tout Excellent

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ Sans Objet ☐

1.4 Visualisation et interprétation du tracé TRF / Ouverture de dossier – Site fournisseur

Pas utile du tout Excellent

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ Sans Objet ☐

1.5 Impression du tracé et du rapport TRF

Pas utile du tout Excellent

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ Sans Objet ☐

1.6 Déconnexion

Pas utile du tout Excellent

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ Sans Objet ☐

1.7 Manuel d'utilisation simplifié Corometrics 172

Pas utile du tout Excellent

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ Sans Objet ☐

3. Quels sujets avez-vous le plus apprécié dans la formation? (par ordre de préférence)

a)
b)
c)
d)

4. Parmi ce que vous avez appris/entendu, que considérez-vous

le plus utile?

le moins utile?

5. Veuillez inscrire vos commentaires sur

a) l'organisation et la structure de la présentation

b) le(s) formateur(s)

c) la documentation

6. Avez-vous des suggestions pour améliorer la formation?

7. Aimeriez-vous avoir une suite à cette formation? (ex. : discussion de cas, supervision, etc.)

Si oui, expliquez vos suggestions (ex. : structure, sujet, temps, etc.)

8. Dans deux ou trois mots (adjectifs), veuillez donner votre évaluation globale de la formation :

Merci de votre collaboration!

Appendix E

Training Document for Telehealth Technicians

LE CENTRE VIRTUEL DE SANTÉ ET DE SERVICES SOCIAUX (CvSSS)

LA TÉLÉSANTÉ SIMPLIFIÉE!

Formation des techniciens télésanté au service TRF

Chantal Bastien, BSc(N)
Coordonnatrice clinique CvSSS
Équipe du CECoT

17 octobre 2014

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Objectifs de la formation

- Objectifs principaux
  - Décrire le service TRF *
  - Identifier les sites participants
  - Décrire l'utilisation de l'application CPN *
  - Prendre connaissance du plan de continuité

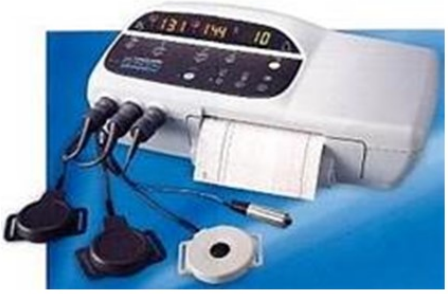
* TRF : test de réactivité foetale
* CPN : Centricity Perinatal

Le service TRF

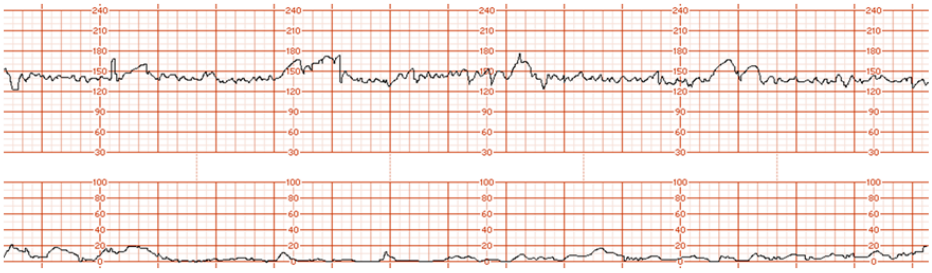
Qu'est-ce qu'un TRF ?

- Capture par un moniteur fœtal électronique
  - Fréquence cardiaque fœtale
  - Mouvements fœtaux
  - Activité utérine
- Durée de 20-40 minutes
- Évaluation du bien-être fœtal
- Résultat du TRF influence la prise en charge de la patiente

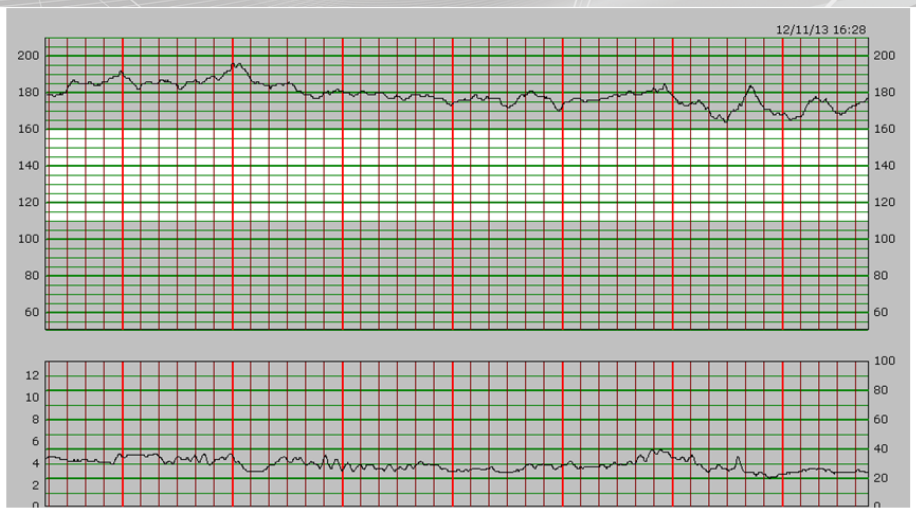
Équipement



Tracé fœtal sur papier du moniteur foetal



Tracé fœtal sur Centricity



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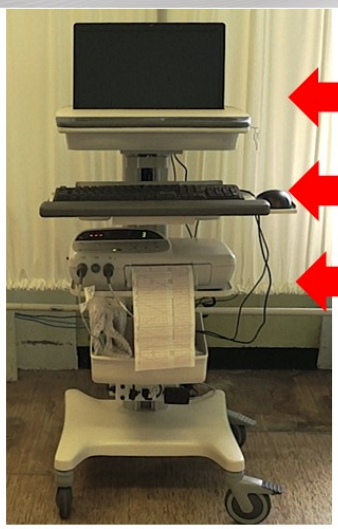
Le chariot clinique



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Qu'est-ce que le service TRF ?

- Capture électronique de tracés TRF
- Transmission électronique de tracés TRF
- Stockage des tracés sur un serveur accessible aux utilisateurs Centricity
- Lecture de tracés TRF à distance
- Transmission électronique de rapports
- Service 24/7 dans la majorité des corridors de service

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Les sites participants

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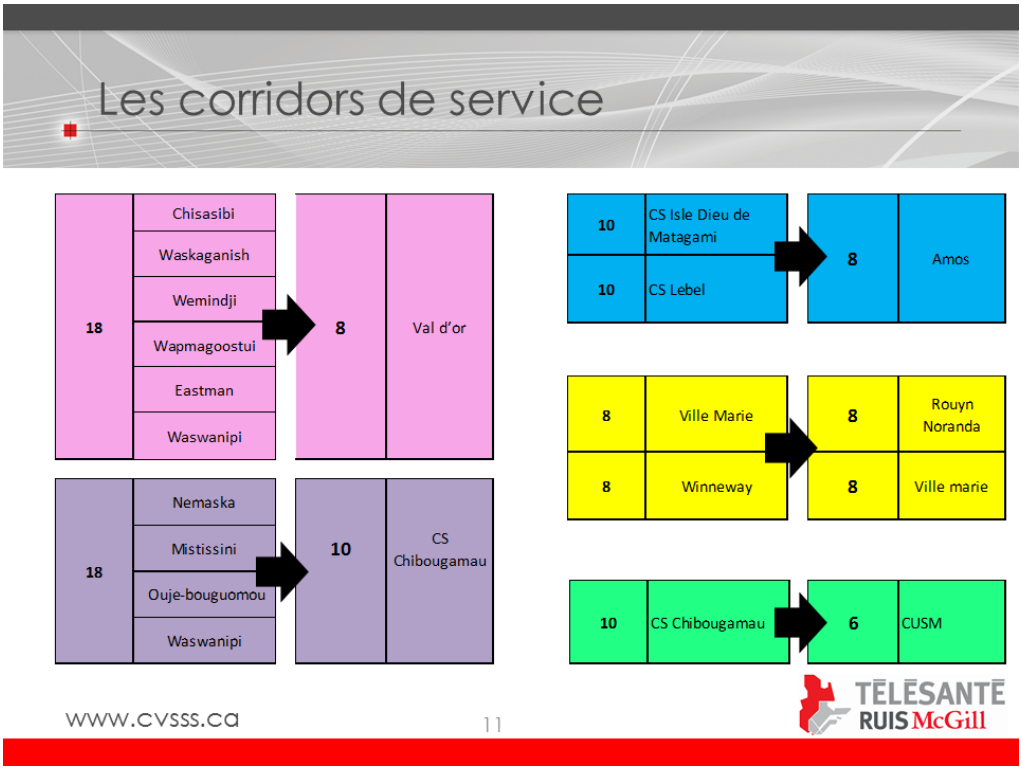
Les corridors de service
18
Chisasibi
Waskaganish
Wemindji
Wapmagoostui
Eastman
Waswanipi
8
Val d'or
18
Nemaska
Mistissini
Ouje-bouguomou
Waswanipi
10
CS Chibougamau
10
CS Isle Dieu de Matagami
10
CS Lebel
8
Amos
8
Ville Marie
8
Winneway
8
Rouyn Noranda
8
Ville marie
10
CS Chibougamau
6
CUSM
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11
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L'utilisation de l'application clinique électronique obstétrique
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- **Plateforme partageable** du serveur au CUSM qui permet la connectivité aux sites autorisés
- **Application clinique électronique (ACE)** d'obstétrique permettant la visualisation de tracés électroniques fœtaux
- **Solution « clé en main »** qui permet l'évaluation du bien-être fœtal par la visualisation de la fréquence cardiaque fœtale et des contractions utérines

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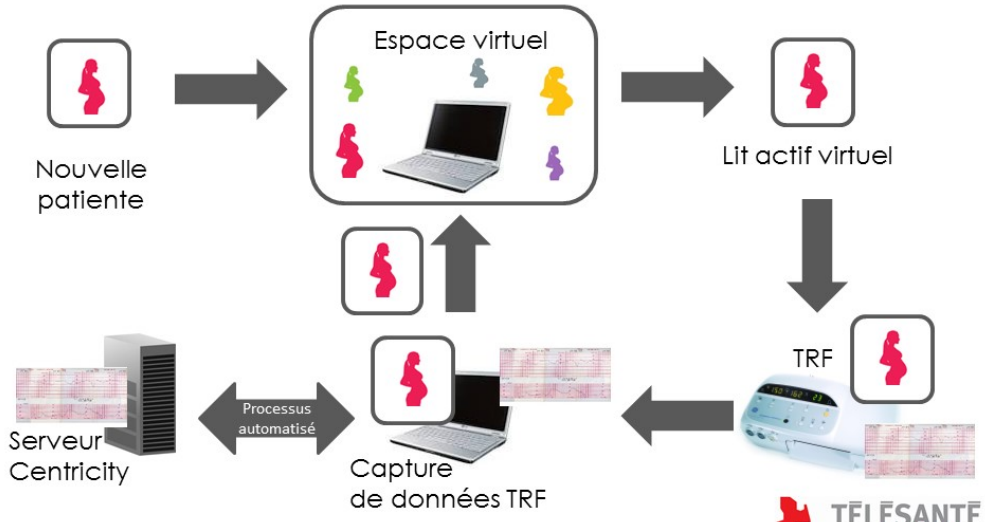
Schéma du processus de capture de TRF



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Centricity Perinatal

- L'ordinateur portable doit toujours resté ouvert – Centricity est branché en réseau et recherche régulièrement ses partenaires
- Serveur est situé au CUSM
- Aucune donnée est sauvegardée localement

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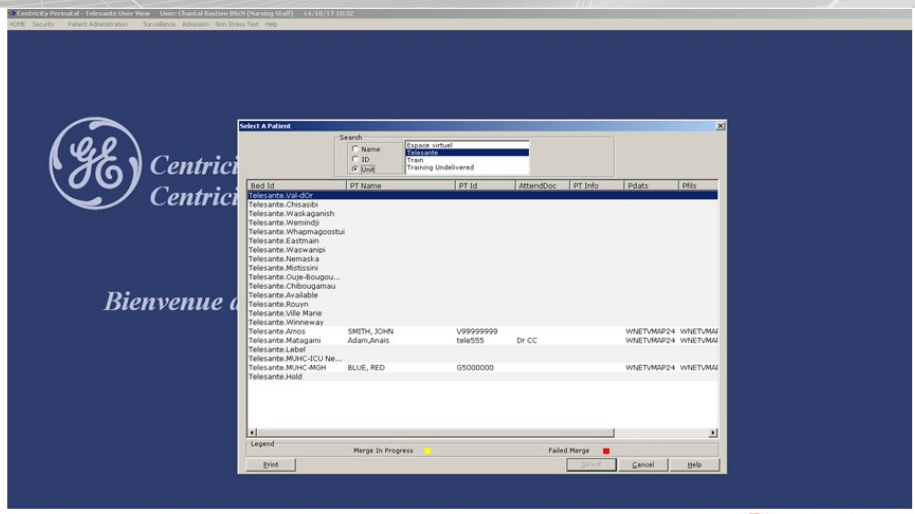

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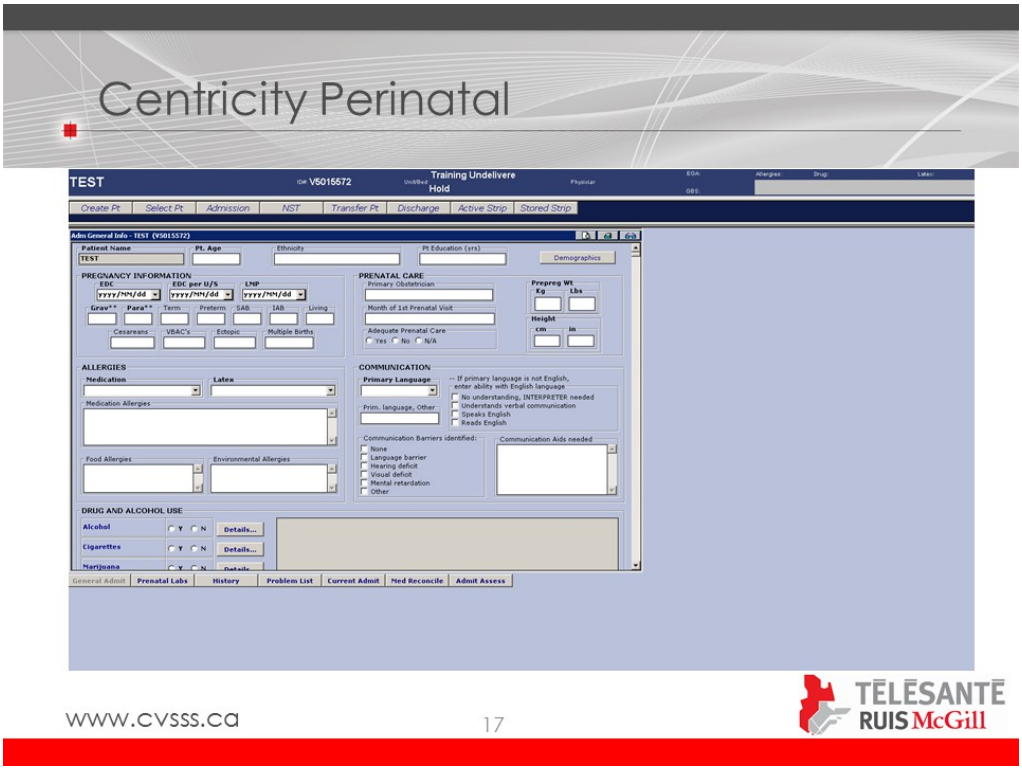
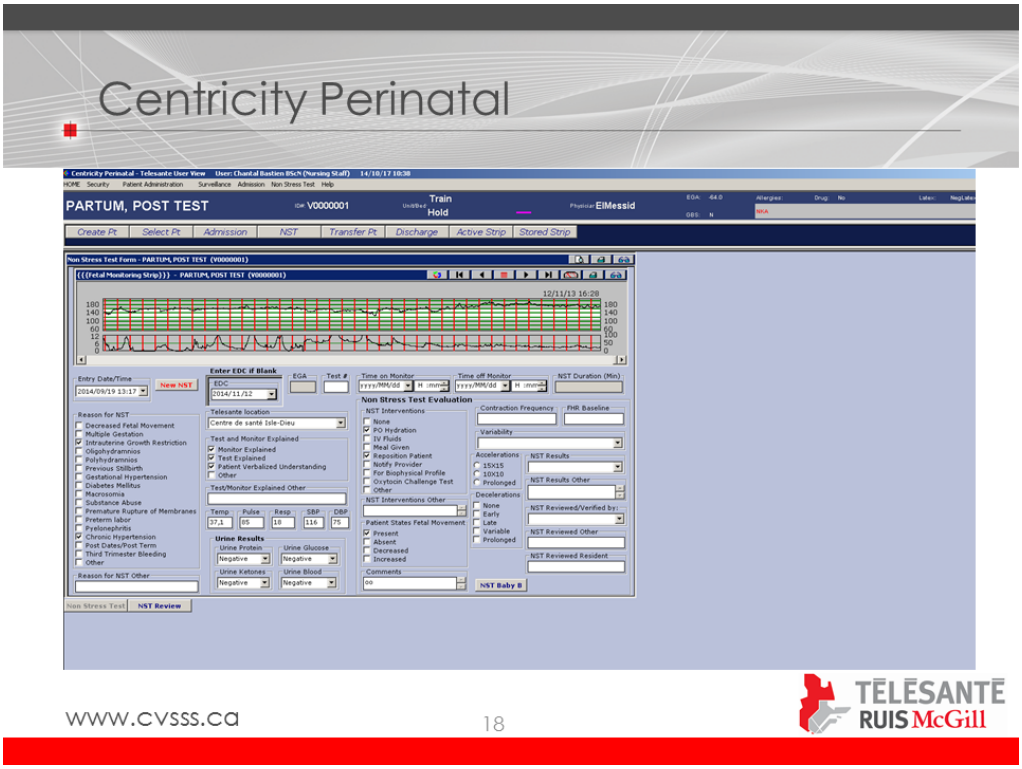

Centricity Perinatal
TEST
Training Undelivere
Hold
Create Pt
Select Pt
Admission
NST
Transfer Pt
Discharge
Active Strip
Stored Strip
PREGNANCY INFORMATION
PRENATAL CARE
ALLERGIES
COMMUNICATION
DRUG AND ALCOHOL USE
www.cvsss.ca
17
TÉLÉSANTÉ
RUIS McGill


Centricity Perinatal
PARTUM, POST TEST
Train
Hold
Create Pt
Select Pt
Admission
NST
Transfer Pt
Discharge
Active Strip
Stored Strip
Non Stress Test Evaluation
www.cvsss.ca
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TÉLÉSANTÉ
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Le plan de continuité

Scénario 1 – Panne de service provenant du CUSM

- Modification aux paramètres de l'ACE ou du site dans l'ACE
- Travaux de maintenance ou de mise à niveau au serveur de l'ACE
- Panne du réseau informatique du CUSM
- Bris matériel (serveur, câbles, etc.)
- Anomalie logicielle (au serveur de l'ACE) provoquant un arrêt de service

Scénario 2 – Panne de service ou problème technique provenant d'un site distant

- Réseau informatique du site distant en panne
- Bris matériel (câbles, poste de travail, moniteur fœtal, etc.)
- Problème de transmission des données
- Apparition d'un message d'alerte au CUSM
- Problème d'accès à l'ACE

CECoT

- Réception des avis de problème
- Transfert des avis à la personne appropriée selon le plan de contingence

Centricity Perinatal

Pour informations supplémentaires

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Courriel : visio-cusm@muhc.mcgill.ca

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