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Optimizing Robotic Surgery Data: Understanding and Enhancing the Coding Process at the MUHC

Health Technology Assessment: Brief Report

Report no. 100

Report prepared for the Technology Assessment Unit (TAU) of the McGill University Health Centre (MUHC)

by

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Mission Statement

The MUHC Health Technology Assessment Unit (TAU) advises hospital administrators and clinical teams in difficult resource allocation decisions. Using an approach based on independent, critical evaluations of the available scientific evidence and a transparent, fair decision-making process, novel and existing medical equipment, drugs and procedures used by healthcare professionals are prioritized on a continuous basis ensuring the best care for life with the best use of resources.

Declaration of Conflicts of Interest

Members of TAU's research staff and policy committee declare no conflicts of interest.

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BACKGROUND

In February 2024, the Institut national d'excellence en santé et en services sociaux (INESSS) requested the McGill University Health Centre (MUHC) to contribute data on the use of robotic surgery across various indications. This effort was part of a province-wide environmental scan mandated by Quebec's Ministry of Health and Social Services (MSSS). The initial focus was on three common oncologic procedures: prostatectomy, nephrectomy, and hysterectomy.

At the MUHC, the data collection and validation were coordinated by the Health Technology Assessment Unit (TAU) in collaboration with the Infocentre, Archives, and surgical teams.

OBJECTIVES

This report aims to:

- Describe the data collection and validation process at the MUHC related to robotic surgery volumes;
- Understand how surgical interventions are translated into administrative codes within hospital databases, with the goal of improving data accuracy and completeness.

METHODS

We collected and validated data using:

- **Local databases:** Clinical-administrative databases (MED-ECHO, OPERA), patient charts, and operating room (OR) protocols.
- **Expert clinical review** by surgeons and data analysts.
- **Chart review** conducted by Archives.

RESULTS

- Coding inconsistencies were found between INESSS-reported MED-ECHO data and MUHC local sources (Power BI, OPERA, clinical review).
- **Main issue**: Robotic surgeries were underreported due to missing CCI code 7SF14ZX, which is needed to flag robotic procedures in MED-ECHO.
- Chart review findings:
    - Over the 6 years of data reviewed, 5.7% of radical prostatectomies, 4.4% of partial nephrectomies and 3.9% of hysterectomies were miscoded as non-robotic.

- OPERA procedural codes used by surgeons were found to be more reliable for identifying robotic surgeries but are not systematically accessed during coding.

CONCLUSIONS

Administrative coding discrepancies led to the underreporting of robotic surgeries in provincial databases. The current coding process lacks integration with internal data sources such as OPERA, and coding personnel may not always have the clinical context to apply robotic codes correctly. Clinical expertise was essential for reconciling data inconsistencies and validating true surgical volumes.

RECOMMENDATIONS

1. **Improve data integration and interoperability**
   - Enable Archives to access OPERA data through tools like Power BI (already underway).
   - Enhance connections between clinical and administrative systems.
2. **Establish a routine validation process**
   - Use OPERA codes as a cross-verification tool.
   - Formalize clinical review of flagged or ambiguous cases.
3. **Support training and standardization**
   - Provide clinical and coding staff with regular training on robotic surgery coding procedures.
   - Introduce standardized documentation templates to support correct coding.
   - Collaborate with INESSS to harmonize data collection and interpretation

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CONTEXTE

En février 2024, l'Institut national d'excellence en santé et en services sociaux (INESSS) a demandé au Centre universitaire de santé McGill (CUSM) de fournir des données sur l'utilisation de la chirurgie robotique pour diverses indications. Cette démarche s'inscrivait dans le cadre d'une analyse environnementale provinciale mandatée par le ministère de la Santé et des Services sociaux (MSSS) du Québec. L'accent initial était mis sur trois interventions oncologiques courantes : la prostatectomie, la néphrectomie et l'hystérectomie.

Au CUSM, la collecte et la validation des données ont été coordonnées par l'Unité d'évaluation des technologies de la santé (UETMIS), en collaboration avec l'Infocentre, les Archives et les équipes chirurgicales.

OBJECTIFS

Ce rapport vise à :

- Décrire le processus de collecte et de validation des données au CUSM concernant les volumes de chirurgie robotique ;
- Comprendre comment les interventions chirurgicales sont traduites en codes administratifs dans les bases de données hospitalières, afin d'améliorer l'exactitude et l'exhaustivité des données.

MÉTHODES

Nous avons recueilli et validé les données à l'aide de :

- **Bases de données locales** : bases de données clinico-administratives (MED-ECHO, OPERA), dossiers des patients et protocoles du bloc opératoire.
- **Examen clinique** par des experts, réalisé par des chirurgiens et des analystes de données.
- **Examen des dossiers** par les Archives.

RÉSULTATS

- Des incohérences de codage ont été constatées entre les données MED-ECHO déclarées par l'INESSS et les sources locales du CUSM (Power BI, OPERA, examen clinique).

- **Problème principal** : Les chirurgies robotisées étaient sous-déclarées en raison de l'absence du code CCI 7SF14ZX, nécessaire pour signaler les interventions robotisées dans MED-ECHO.

- Résultats de l'examen des dossiers :
    - Au cours des 6 années de données examinées, 5,7 % des prostatectomies radicales, 4,4 % des néphrectomies partielles et 3,9 % des hystérectomies ont été mal codées comme non robotiques..
    - Les codes d'intervention OPERA utilisés par les chirurgiens se sont avérés plus fiables pour identifier les chirurgies robotisées, mais ils ne sont pas systématiquement consultés lors du codage.

CONCLUSIONS

Des divergences dans le codage administratif ont entraîné une sous-déclaration des chirurgies robotisées dans les bases de données provinciales. Le processus de codage actuel manque d'intégration avec les sources de données internes comme OPERA, et le personnel de codage ne dispose pas toujours du contexte clinique nécessaire pour appliquer correctement les codes robotisés. L'expertise clinique était essentielle pour corriger les incohérences des données et valider les volumes chirurgicaux réels.

RECOMMANDATIONS

1. **Améliorer l'intégration et l'interopérabilité des données**
    - Permettre aux Archives d'accéder aux données OPERA grâce à des outils comme Power BI (déjà en cours).
    - Améliorer les connexions entre les systèmes cliniques et administratifs.
2. **Établir un processus de validation systématique**
    - Utiliser les codes OPERA comme outil de vérification croisée.
    - Formaliser l'examen clinique des cas signalés ou ambigus.
3. **Soutenir la formation et la normalisation du codage**
    - Offrir au personnel clinique et de codage une formation régulière sur les procédures de codage de la chirurgie robotique.
    - Introduire des modèles de documentation standardisés pour assurer un codage correct.
    - Collaborer avec l'INESSS pour harmoniser la collecte et l'interprétation des données entre les établissements.

LIST OF ABBREVIATIONS

CCI	Canadian Classification of Health Interventions, developed by the Canadian Institute for Health Information (CIHI) to classify and code health interventions, which are the treatments, procedures, and services provided to patients.
HTA	Health technology assessment
INESSS	Institut National d'Excellence en Santé et en Service Sociaux
MED-ECHO	The MED-ÉCHO bank contains data relating to hospital stays in Quebec hospitals providing general and specialized care.
MSSS	Ministère de la Santé et des Services sociaux/Ministry of Health and Social Services
MUHC	McGill University Health Centre
TAU	MUHC Technology Assessment Unit

OPTIMIZING ROBOTIC SURGERY DATA: UNDERSTANDING AND ENHANCING THE CODING PROCESS AT THE MUHC

1. CONTEXT

In February 2024, the Institut National d'Excellence en Santé et en Service Sociaux (INESSS) requested the collaboration of the MUHC in collecting data on the use of robotic surgery across diverse indications. Dr. Alan Forster, Director of Quality, Innovation and Performance at the MUHC designated Nisha Almeida, head of the MUHC Health Technology Assessment Unit and Dr. Simon Tanguay, chief urologist at the MUHC, to coordinate the effort.

1.1 INESSS Mandate

INESSS was tasked by the Ministry of Health and Social Services (MSSS) to perform an environmental scan of the use of robotic surgery across hospitals in the province of Quebec.

The first part of the project focussed on the most frequent indications for robotic surgery in Quebec and elsewhere, namely prostatectomy, nephrectomy and hysterectomy for oncological indications (prostate cancer, kidney cancer, endometrial cancer).

To support this evaluation, INESSS aimed to collect information from hospitals equipped with robotic systems through the completion of a questionnaire on surgical volumes, current practice and acquisition costs.

1.2 MUHC team

The data collection and validation process was performed by the Infocentre, Archives and surgical teams of the MUHC, and coordinated by the Health Technology Assessment Unit (TAU).

2. OBJECTIVE OF THE REPORT

The objective of this report is to:

- describe the data collection and validation process at the MUHC related to robotic surgery volumes;

- understand the pathway of translating a surgical intervention into a code within the MUHC databases, with the aim of improving this process.

3. DATA COLLECTION ON VOLUME OF ROBOTIC SURGERIES

3.1 Data sources

In the course of this data collection exercise for INESSS, the following data sources and teams were queried:

- Clinical-administrative databases (MED-ECHO, OPERA) within **Infocentre**
- Clinical-administrative databases (MED-ECHO) and patient charts within **Archives**
- Patient charts and OR protocols within the **surgical teams**

3.2 INESSS questionnaire

The questionnaire collected information for the following key areas:

Question	Information provided by:
Number of surgeons performing surgical procedures via robotic, laparoscopic, or open approaches for:	
• Prostatectomy	Dr. Simon Tanguay
• Nephrectomy	Dr. Simon Tanguay
• Hysterectomy	Dr. Togas Tulandi
• Other: Transoral robotic surgery (TORS)	Dr. Nader Sadeghi
Annual surgical volumes for prostatectomy, nephrectomy and hysterectomy using each approach for the fiscal years 2018-2019 to 2023-2024	Infocentre, Archives, Surgical teams
Annual volume of procedures for other indications involving robotic surgery during the same timeframe	Infocentre, Archives, Surgical teams
Organization of services for robot-assisted surgeries	Dr. Simon Tanguay
Team structure, professional training and expertise of the robot-assisted surgery programs	Dr. Simon Tanguay
Process for monitoring the quality of practices associated with robot-assisted surgery	Dr. Simon Tanguay

4. DATA VALIDATION

4.1 INESSS

- INESSS extracted surgical volume data for robotic, laparoscopic and open procedures from 2018 to 2023 using the provincial clinical-administrative database (MED-ECHO). The MUHC was then asked to validate this information and, where necessary, correct them based on locally complied data sources.
- At the request of the MUHC data validation team, INESSS provided the diagnosis (ICD-10) and intervention codes (CCI) used to extract data from MED-ECHO for three main surgical categories (prostatectomy, nephrectomy and hysterectomy) (Table A-1).
- At the MUHC, the surgical teams, Infocentre and Archives collaborated to conduct a comprehensive validation of these data.

4.2 MUHC Infocentre

- The Infocentre team manages the data warehouse of the MUHC, which houses data from clinical and administrative databases across the hospital.
- Analysts at Infocentre used the MED-ECHO codes provided by INESSS to extract data on surgical volumes for the 3 indicated categories.
- However, discrepancies were identified between INESSS-reported data and locally compiled statistics, necessitating an in-depth review to reconcile these differences.

4.3 MUHC Surgical team input

- The clinical expert, Dr. Simon Tanguay, has access to patient charts and operating room protocols, and clinical knowledge of the procedures, allowing for a reconciliation of discrepancies between administrative data and actual surgical activity.
- Following a review of the data extracted by Infocentre, Dr. Tanguay identified some inconsistencies:
    - Prostatectomies:
        - No laparoscopic or open prostatectomies have been performed at the MUHC since 2018; however, our data reported such cases.
        - Conversions from robot to open prostatectomies are very rare, which contradicts the numbers reported in the data.
    - Partial nephrectomies:

- The Infocentre data, extracted using INESSS-supplied diagnostic and intervention codes, showed 0 robotic surgeries, which contradicts data compiled by the surgical teams.

4.4 MUHC Archives

- A chart review was conducted to resolve discrepancies between OPERA codes (used by the surgical team to indicate a robotic approach) and the MED-ECHO intervention code (7SF14ZX), which is used to indicate that the intervention used robotic surgery.
- For the 3 categories (prostatectomy, nephrectomy and hysterectomy), Infocentre extracted all cases with OPERA codes indicating a robotic approach and provided the corresponding medical record numbers (MRN) to the Archives team for review.

5. FINDINGS

5.1 Coding discrepancies

Inconsistencies between INESSS-reported surgical volumes (from MED-ECHO) and locally compiled data (PowerBI, clinical input, and archives) were mainly due to underreported or misclassified robotic cases arising from:

- **Missing code to indicate robot use:** The main reason for inability to capture robotic surgery cases was most often attributed to a missing code in MED-ECHO that indicates a robotic approach.
    - It was clarified that, for robotic surgery cases, while a single OPERA code is used by the surgical team to indicate use of a robotic approach, in MED-ECHO, **2 separate codes** are required: one to indicate open or laparoscopic approach and a second code to indicate the use of a robot (CCI code 7SF14ZX). Often, the second code that indicates a robotic approach was missing. For example, 27 prostatectomy cases were identified with the OPERA code 500821 (indicating a robotic procedure) but that lacked the corresponding CCI flag 7SF14ZX.
    - OPERA procedural codes used internally were therefore more accurate for identifying robotic approaches, but are not integrated into coding

processes to ensure that all robotic surgeries are correctly captured at the time of coding.

- Surgeon input (e.g., from Dr. Tanguay) was critical to identifying data errors and guiding validation efforts.

5.2 Final report from Archives following data validation

OPERA codes were first used to identify robotic surgeries across the 3 indications below, which were then validated through a chart review by Archives. Surgeries miscoded as non-robotic ranged from 3.9% to 5.7% across the 3 indications over the six years of data reviewed. Final robotic surgery volumes are available in Appendix Table A-2.

Surgical procedure	No. of cases reviewed (2018-2024)	Proportion miscoded as non-robotic cases
Radical Prostatectomy	492	28 (5.7%)
Partial Nephrectomy	250	11 (4.4%)
Hysterectomy	336	13 (3.9 %)

6. RECOMMENDATIONS

6.1 Enhance data integration and system interoperability

- Currently, Archives does not have access to OPERA codes. Creating a Power BI report from OPERA data to ensure better capture of robot-assisted surgeries during coding would help improve accuracy. This process is currently underway at the MUHC.
- Several existing systems (operating room, administrative) currently collect data on surgical volume. Supporting interoperability between these systems would enhance internal data monitoring and validation.

6.2 Establish a routine validation process

- Incorporate local OPERA codes systematically for cross-verification.
- Include clinical review of outlier or ambiguous cases.
- Support collaboration between archives, clinical leads, and IT/data teams for more agile data validation and reporting.

6.3 Support training and standardization

- Provide ongoing education for data entry personnel about robotic procedures and associated codes.
- Develop standardized templates or prompts in clinical systems to support correct coding at the point of care.
- Establish collaborations with INESSS to enhance standardization.

APPENDICES

APPENDIX A: CODES AND VOLUMES FOR ROBOTIC SURGERY

Table A-1. MED-ECHO and OPERA codes used to identify robotic surgery cases at the MUHC

Intervention	Codes d'intervention INESSS	Description	Robot code flag in MED-ECHO	Opera code	Comments
Prostatectomie radicale	1QT91DA	Excise rad prostate EA	7.SF.14. ZX	500821	INESSS-provided MED-ECHO codes identified all robotic surgeries, but OPERA codes were used to validate the data
	1QT91PB	Excise rad prostate perineal OA	7.SF.14. ZX		
	1QT91PK	Excise rad prostate retropubic OA	7.SF.14. ZX		
Nephrectomie partielle	1.PC.87.LA	Excise prt kidney OA	7.SF.14. ZX	500822	INESSS-provided MED-ECHO codes identified 0 robotic surgeries; used OPERA codes to identify cases which were verified by Archives
	1.PC.87.DA	Excise prt kidney EA	7.SF.14. ZX	500956	
Hysterectomie	1.RM.89.DA	Excise tot uterus EA	7.SF.14. ZX	100279	INESSS-provided MED-ECHO diagnostic codes identified 0 robotic surgeries; used OPERA codes to identify cases which were verified by Archives
	1.RM.89.LA	Excise tot uterus OA	7.SF.14. ZX	101500	
	1.RM.89.CA	Excise tot uterus PO	7.SF.14. ZX	101501	
	1.RM.89.AA	Excise tot uterus combo EA w vag app	7.SF.14. ZX	101502	
				101505	
				101507	
				101508	
				101509	
				101510	
				101513	

Intervention	Codes d'intervention INESSS	Description	Robot code flag in MED-ECHO	Opera code	Comments
				101520	
				101521	
				101525	
				101526	
				101635	
				102005	
				102010	
Cystectomie	1.PM.91.RR	Excise rad bladder OA w non contnt urin divers	7.SF.14. ZX	500215	No codes provided by INESSS
	1.PM.91.EN	Excise rad bladder EA w non contnt urin divers	7.SF.14. ZX	500830	
	1.PM.91.DA-XX-G	Excise rad bladder EA w neoblad &ped flp	7.SF.14. ZX	500835	
	1.PM.91.LA-XX-G	Excise rad bladder OA w neoblad &ped flp	7.SF.14. ZX		
TORS	1FJ87LA	Excise prt tongue OA	7.SF.14. ZX	801801	No codes provided by INESSS
	1FJ91LA	Excise rad tongue OA	7.SF.14. ZX	801804	
	1FR89LA	Excise tot tonsil OA	7.SF.14. ZX	800715	
	1FU87NZ	Excise prt thyr gl lat neck OA	7.SF.14. ZX	800090	
	1FX87BA	Excise prt orophrnx EPO	7.SF.14. ZX	801800	
	1FX87LA	Excise prt orophrnx OA autogr	7.SF.14. ZX	800716	
	1FX91LA	Excise rad orophrnx OA ped flp	7.SF.14. ZX	800522	
	1MC87LA	Excise prt lymph nd cervical OA	7.SF.14. ZX	801802	
	1MC91LA	Excise rad lymph nd cerv OA w rad excisn free flp	7.SF.14. ZX		
	1MC91VB	Excise rad lymph nd cerv OA w mod rad excisn	7.SF.14. ZX		

Table A-2. Volumes of surgeries at the MUHC according to surgical approach, 2018-2024

Indication	Approche	Source	Volume annuel					
			2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
Cancer de la prostate / Prostatectomie radicale **Code diagnostic** : C61 (n=430); **Code d'intervention** : 1QT91DA; 1QT91PB; 1QT91PK;	Robot	Infocentre CUSM (MED-ECHO) **validé par un examen des dossiers**	63	52	55	62	90	109
	Laparoscopie	Infocentre CUSM (MED-ECHO) **validé par un examen des dossiers**	0	0	0	0	0	0
	Ouverte	Infocentre CUSM (MED-ECHO) **validé par un examen des dossiers**	0	0	0	0	1	1
Cancer du rein / Néphrectomie partielle **Code diagnostic** : C65 (n=0) **Code d'intervention** : 1PC87DA; 1PC87LA; 1PC87LAXXE; 1PC87LAXXG; 1.PC.87.NQ	Robot	Infocentre CUSM (codes OPERA) **validés par un examen des dossiers**	29	40	22	37	50	72
	Laparoscopie	Infocentre CUSM (MED-ECHO), avec les codes CCI et sans codes de diagnostic	0	0	0	1	2	1
	Ouverte	Infocentre CUSM (MED-ECHO), avec les codes CCI et sans codes diagnostic	39	49	29	33	29	29
Cancer de l'endomètre / Hystérectomie **Code diagnostic :** C54.0 (n=1), C54.1, C54.2, (n=3), C54.3 (n=4); C54.8 (n=2); C54.9 (n=9); C56.0 (n=3); C57.0 (n=1);	Robot	Infocentre CUSM (MED-ECHO **validé par un examen des dossiers**), avec les codes extras	54	54	51	48	45	51
	Laparoscopie	Infocentre CUSM (MED-ECHO), avec les codes extras	44	47	37	41	39	39

Indication	Approche	Source	Volume annuel					
			2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
C57.8 (n=1); D39.1 (n=1); N81.2 (n=1); N81.3 (n=1); N85.0 (n=1); C18.7 (n=1); C50.81 (n=1) **Code d'intervention :** 1RM89AA; 1RM89CA; 1RM89DA; 1RM89LA 1RM91AA (n=2); 1RM91DA (n=32); 1RM91LA (n=18); 1YM87LA (n=1); 1NM87DF (n=1); 1PC91DA (n=1); 1RD89LA (n=2)	Ouverte	Infocentre CUSM (MED-ECHO), avec les codes extras	21	18	24	25	17	19
	Vaginale	Infocentre CUSM (MED-ECHO)	1 (1RM89CA)	3 (1RM89CA)	2 (1RM89CA)	1 (1RM89CA)	3 (1RM89CA)	0
Cystectomie (données CUSM) Codes utilisés par CUSM : **Code d'intervention** : 1.PM.91.DA, 1.PM.91.LA, 1.PM.91.DA-XX-G, 1.PM.91.LA-XX-G, 1.PM.91.EN-XX-G, 1.PM.91.RR-XX-G, 1.PM.91.EN, 1.PM.91.RR	Robot		5	4	4	6	7	7
	Laparoscopie		0	0	0	0	0	0
	Ouverte		36	46	53	41	34	33
TORS 1.FR.89 1.MC.89 (Functional) 1.MC.87 (Partial) 1.MC.91 (Radical). 1.FJ.87 (partial) 1.FJ.91 (Radical) 1.FX.87 (partial)	Robot		19	23	10	21	20	27
	Laparoscopie		0	0	0	0	0	0
	Ouverte		924	878	717	726	673	258

Indication	Approche	Source	Volume annuel					
			2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
1.FX.91 (radical) 1.FU.87 1.FJ.87 1.GE.87 (partial) 1.GE.89 (total) 1.GE.91 (Radical)								
Robotic lymphadenectomy (données CUSM) Codes utilisés par CUSM : **Code d'intervention** : 1.MH.87.DA; 1.MH.89.DA; 1.MH.87.LA; 1.MH.89.LA	Robot		31	36	28	28	23	27
	Laparoscopie		39	31	26	28	32	27
	Ouverte		57	50	56	59	39	35
Robotic adrenalectomy Codes utilisés par CUSM : **Code d'intervention :** 1.PB.87.DA; 1.PB.89.DA; 1.PB.87.LB ; 1.PB.87.PF; 1.PB.87.QF; 1.PB.89.LB; 1.PB.89.PF; 1.PB.89.QF	Robot		0	0	0	0	1	1
	Laparoscopie		9	18	7	14	11	17
	Ouverte		6	11	12	13	12	14