



## Diagnostic Group for Elderly Patients With Loss of Autonomy – A feasibility Study

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### ABSTRACT

A summary analysis of the workflow of the diagnostic services has shown that a large number of examinations concerning people over 65 years of age are possible in a safe manner in the patient's living environment. Knowing that the mobilization of elderly patients with loss of autonomy represents a challenge, in terms of logistics and on the health system itself, we have proposed certain diagnostic methods in geriatric centers which can be organized in Long-term hospital center (LTHC) or in the community. We believe that LTHCs could be associated with a diagnostic group for elderly person with loss of autonomy to capture this patient profile and thus reduce hospital traffic. This first approach is mainly philosophical. Then, with the collaboration of interested healthcare institutions, we will collect evidence from the past five years to better quantify the human, financial and reorganization needs. This reflection reinforces the need to develop support at home and in LTHCs for medical care that does not require intensive or critical medical monitoring.

**Keywords:** Seniors, workflow, decongestion of emergency departments, care in the living environment.

### INTRODUCTION

A recent project by the Quebec Ministry of Health and Social Services (MSSS) aims to use ionizing radiation in long-term care hospitals (CHSLD/LTHC) to provide dental diagnostic services to the patients housed there. This approach leads us to reflect on the possibility of adding other diagnostic methods popular in the elderly and whose preparation time is not very complex. We will devote our reflection to the case of elderly people with a loss of autonomy. This is a patient profile requiring support and whose care is often prolonged in a hospital centre. Given the chronic illnesses that reach their age, certain routine examinations regularly take them to the hospital for medical follow-ups in addition to admissions to the emergency room when their condition worsens. A 24-hour stay in the emergency room can make an elderly person confused and they can lose up to 10% of their ability to do their usual tasks.[1].

Canada has 19% of people aged 65 and over [2].

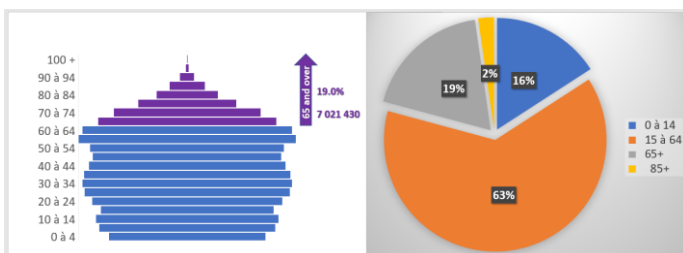


Fig. 1: People aged 65 and over represent 19% of the Canadian population according to the 2021 census

Seniors are putting pressure on the Canadian health care system. They occupy stretchers in the emergency room for a long time, which are thus overwhelmed, due to a lack of accommodation. [3].

The healthcare system seems to be on the brink. It's time to consider, outside the hospital [4] [5], a service offer for non-critical care for the elderly.

Instead of keeping the elderly in the hospital, why not continue the medicalization of CHSLDs so that the care goes to the patient, in his dedicated room, rather than it being up to the patient to go to his usual medical care?

The objective of this study is to lead to an improvement in the management of geriatric patients to relieve the health network of Canada.

### MATERIALS ET METHODS

Seven (7) premises motivated this study:

1. Characteristics of elderly person with loss of autonomy
  - Often polypathological [6]
  - Have specific geriatric syndromes.
2. Predominant pathologies in the elderly [6]
  - Alzheimer's
  - Dysphagia
  - Cancer
  - Fractures
  - Dementia
  - Stroke
  - Cardiovascular illnesses
  - Respiratory diseases
  - Neurodegenerative diseases

- Parkinson's
- Reduced mobility
- Fall
- Old age.

### 3. Diagnostic imaging modalities used in geriatrics

Medical equipment that can be mobile

- General radiography
- Dental X-ray
- Ultrasonography
- Echocardiography
- Digestive endoscopy

Mainly stationary medical equipment

- Computed tomography
- Magnetic resonance
- SPECT
- PET
- Mammography

### 4. Issue of diagnostic examinations requiring the presence of elderly person with loss of autonomy

- Logistics
- Accompaniment
- Duration of exams
- Long-term hospital accommodation
- Impact on the average length of stay (in the emergency room and on the floors)

### 5. Canadian demographics

Canada has a significant number of seniors with an expected increase due to the rapid growth in the number of millennials [2].

### 6. News on emergency room traffic in Quebec and Canada

Since the beginning of the fall, Quebec has faced an unusual occupation of emergency rooms [1], [3], [4] and this situation is observed elsewhere in Canada.

### 7. Cries from the heart of the Premier of Quebec with regard to overwhelmed emergencies

«Minor problems must be resolved before we arrive at the emergency room»[3].

## RESULTS

### Medical technologies that help solve minor problems

Diagnostic technologies

- Ultrasound
- Monitoring of vital signs
- Physiological monitoring
- Diagnostic telehealth
- Connected smart bed
- MAPA
- Holter
- and above all CardioMémo installed at home and examined in real time remotely

Therapeutic technologies

- Therapeutic telehealth
  - Remote monitoring of renal therapies, diabetics, treatment of pain by intravenous therapy.
  - Connected smart bed equipped with physiological monitoring and intravenous therapy.

### Medical specialties covered in CHSLDs

- Interventional Technologies in CHSLD, Elders' home (MDA), Retirement home (RPA): **Minor surgery**
- Medical biology analyzes in CHSLD, MDA, RPA: **Sampling, Blood bank, Biochemistry, Centrifuge, PCR test, Vaccination**
- Pharmacy: **Decentralized automated cabinet, Infusion pumps, Medicine trolley**
- Oral care: **Dental X-ray, Oral hygiene.**

### Types of services that qualify for the CHSLD

- Pharmacy
- General care
- Routine diagnostic tests for the elderly
- General medicine (dressing, hygiene, medication)
- Nutrition
- Rehabilitation (physiotherapy, occupational therapy)
- Palliative care
- Spiritual care
- Medical assistance in dying.

### Characteristics expected of medical equipment for use outside hospitals

- Operate at room temperature
- Portability
- Easy to use
- Connectivity with the HIS and the affiliated hospital
- Reasonable electrical autonomy in the event of a power outage around this home / CHSLD / Seniors' home.

### Medical imaging technologies in CHSLDs

- Subcompact ultrasound
- Compact ultrasound system
- Bladder ultrasound
- Portable dental x-ray
- Multifunctional radiofluoroscopy

### Laboratory technologies in CHSLDs

- Sampling equipment
  - Centrifuge
  - Pharmaceutical refrigerator
  - Freezer
- Delocalized medical biology exams
  - Biochemistry (i-Stat type)
  - Ph and blood gas analyzer

Geriatric poles in the community

- Medical technologies of local diagnostic poles in the community
  - Medical imaging: X-ray, Ultrasound
  - Medical analysis laboratories: Sampling, Centrifuge, PCR test
  - Surgery: Hospitalization at home of Medicine-Surgery
  - Medicine Units: Home Support.

Synergistic use of the radiofluoroscopy room in a CHSLD

The low volume of examination of each specialty allows this hypothesis.

- Fluoroscopy: Barium enemas, Barium meals, Barium sips, Infiltrations
- X-ray: General X-ray, Dental X-ray
- Endoscopy: Endoscopic retrograde cholangiopancreatography, Gastroscopy, Colonoscopy, Endoscopic capsule, Bronchoscopy, Urology, Manometry
- Surgery: Minor surgery.

Possible critical care in CHSLDs

- Physiological monitoring: Telemetry
- Cardiac electrophysiology: Cardio Memo and Ambulatory blood pressure monitoring
- Monitoring of vital signs: Oxygen saturation (SpO2)
- Surgery: Minor surgery (in the radiofluoroscopy room)

Medical supervision of critical care in a CHSLD center

To preserve the traditional living environment of CHSLDs, wanting them to preserve the living environment, the entire critical patient monitoring component would benefit from being carried out outside the CHSLD; in a “War Room” dedicated to the cluster of CHSLDs of the Health Authority.

A permanent link will be maintained with the local nursing station to communicate alarms to identify the room in which to intervene immediately.

Consequently, the training of local nurses will have to be adapted to this new professional profile.

If the medical beds are connected to the hospital information system, the night light under the bed could serve as a general indicator of the patient's health status;

- Green: everything is fine
- Orange: worrying
- Red: immediate intervention required.

"War Room" for monitoring critical vital signs in CHSLDs

It's all about installing diagnostic sensors and remotely monitoring critical vital signs [7] and to communicate the alarms to the nursing station of the CHSLD concerned.



Fig. 2 : SpO2 Central Monitoring Unit / Pulse oximetry at home



Fig. 3: Cardiac Central Monitoring Unit (CMU)

**DISCUSSIONS**

A few lines of thought are summarised in Table 1.

Table 1: ideas to improve healthcare system for elderly

| Ideas   | Short explanation   |
|---|---|
| Keep elderly patient out of Short term hospitals                      | Patients already admitted to a CHSLD are only transferred to the hospital for specialized care that is not offered in a medicalized CHSLD   |
| Keep elderly patient mostly at Home                                   | Patients already benefiting from a home support program will receive the maximum care at home and will only go to the hospital for specialized care requiring fixed medical equipment not adapted for the home            |
| Develop a non-natural caregiver program                               | A non-natural caregiver program (from private health agencies or Local community service center) should be set up to medicalize the homes of people waiting for a place in a CHSLD, if their place of residence allows it |
| Mobile medical assistance units for proximity care in the community   | Set up mobile medical assistance units that will serve as traveling hospitals to provide emergency pre-hospital care, with a laboratory and an integrated minor surgery unit  |
| Redefine emergency care for elderly                                   | Reserve emergency care for patients whose life is imminently at risk  |
| Multidisciplinary medical team for rapid response at home or in CHSLD | As much as possible, keep the patient at home or in a CHSLD with a mixed mobile squad made up of a doctor, nurse, respiratory therapist and radiology technologist, depending on the mission.                             |

Thus, an improvement in the care of geriatric patients can be achieved without this taking place in the hospital's theater of

operations. With the change of course that we are proposing, it is possible to retain a greater number of patients in CHSLDs or at home. This will require major technological development as well as a transfer of skills to the patient's living environment. This reduces overcrowding in the hospital, making room for a younger clientele, likely to have shorter hospital stays and greater mobility, thereby accelerating the stages of the care episode.

A more scientific analysis is to come with conclusive data and indicators confirming or invalidating this hypothesis. We do not yet know whether such an approach exacerbates the labor shortage.

The main missing data to strengthen our study is the statistic of emergency stretcher occupancy by people over 65 years of age. Such information would make it possible to better measure the extent of the need and adjust the solutions according to the regions.

## CONCLUSIONS

This summary reflection deserves to be deepened. Such an exercise will require multidisciplinary collaboration in the areas pictured in Table 2:

Table 2: Roles in multidisciplinary collaboration for elderly patients

| Stakeholder                     | Expected improvements  |
|---------------------------------|--|
| Human resources                 | Impact of the shortage of personnel on our technological approach  |
| Organizational governance       | Administrative feasibility of the idea and its impact on current governance  |
| Healthcare Statistics Experts   | Collection of statistical data on the occupation of stretchers and hospital beds by the elderly  |
| Medical industry                | Necessary technological adjustments on current equipment to make them permanently connected to the HIS of the partner healthcare facility              |
| Teaching and research           | Improve knowledge and encourage university training adapted to the new governance of home care in the community  |
| Clinical biomedical engineering | Recommend the appropriate technology   |
| Medical physics                 | Adapt radiation protection and dosimetry processes in decentralized health care in the living environment of the elderly person with loss of autonomy. |

We seek the collaboration of hospitals currently facing the challenge of overcrowding in emergency rooms to obtain evidence and strengthen the concept.

We hope the technological decentralization solution we propose will make hospitals an environment reserved for intensive, tertiary and emergency care. Hospitalization in the hospital would thus become brief, the time for critical care; general care can continue at home or in a CHSLD. Permanent surveillance in the “War Room” will help ensure the security of decentralized critical surveillance.

## ABBREVIATIONS

|                    |                             |
|--------------------|-----------------------------|
| <b>CHSLD/LTHC:</b> | Long-term hospital center   |
| <b>HIS:</b>        | Hospital information system |
| <b>MDA:</b>        | Elders' home                |
| <b>RPA:</b>        | Retirement home             |

## REFERENCES

- [1] H. Archambault, « Trois fois plus de patients attendent des jours sur une civière à l'urgence », *Le Journal de Montréal*. <https://www.journaldemontreal.com/2022/03/21/encore-plus-long-avant-davoir-un-lit> (consulté le 27 décembre 2022).
- [2] S. C. Gouvernement du Canada, « Portrait générationnel de la population vieillissante du Canada selon le Recensement de 2021 », 27 avril 2022. <https://www12.statcan.gc.ca/census-recensement/2021/as-sa/98-200-X/2021003/98-200-X2021003-fra.cfm> (consulté le 26 décembre 2022).
- [3] Z. P.- ICI.Radio-Canada.ca, « Les urgences du Québec engorgées faute d'hébergement pour les aînés », *Radio-Canada.ca*. <https://ici.radio-canada.ca/nouvelle/1928518/lits-hopitaux-desengorger-urgences> (consulté le 10 décembre 2022).
- [4] G. Ouimet, « Le système de santé au bord du gouffre: les soins à domicile sont-ils l'avenir? », *24 heures*, 21 janvier 2022. <https://www.24heures.ca/2022/01/21/le-systeme-de-sante-au-bord-du-gouffre-les-soins-a-domicile-sont-ils-lavenir> (consulté le 10 décembre 2022).
- [5] Deloitte, « L'hospitalisation à domicile. Un modèle d'avenir ». 2022. Consulté le: 10 décembre 2022. [En ligne]. Disponible sur: <https://www2.deloitte.com/content/dam/Deloitte/ch/Documents/public-sector/deloitte-ch-fr-hospital-at-home-new.pdf>
- [6] S. C. Gouvernement du Canada, « Indicateurs de vieillissement en santé », 27 juillet 2010. <https://www150.statcan.gc.ca/t1/tb11/fr/tv.action?pid=1310046601> (consulté le 26 décembre 2022).
- [7] santeestrie.qc.ca, « Saturométrie nocturne à domicile ». octobre 2020. Consulté le: 1 janvier 2023. [En ligne]. Disponible sur: [https://www.santeestrie.qc.ca/clients/SanteEstris/soins-services/Specialises/Examens-tests/Sommeil/Feuillet\\_Saturometrie\\_VF\\_FR\\_08oct2020.pdf](https://www.santeestrie.qc.ca/clients/SanteEstris/soins-services/Specialises/Examens-tests/Sommeil/Feuillet_Saturometrie_VF_FR_08oct2020.pdf)