Health care service utilization among the elderly: findings from the Study to Understand the Chronic Condition Experience of the Elderly and the Disabled (SUCCEED project)

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Abstract
Rationale and objectives Age-related effects on health service utilization are not well understood. Most previous studies have examined only a single specific health care service or disease condition or have focused exclusively on economic variables. We aim to measure age-related change in health care utilization among the elderly.

Methods A population-based retrospective cohort study was conducted using linked data from four administrative databases (OHIP, ODB, CIHI and RPDB). All Ontario residents over the age of 65 years and eligible for public health coverage were included in the analysis (approximately 1.6 million residents). Main outcome measures include utilization indicators for family physician visits, specialist physician visits, Emergency Department visits, drugs, lab claims, X-rays, inpatient admissions, CT scans and MRI scans.

Results The mean number of utilization events for Ontarians aged 65+ years for the 1-year study period was 70 events (women = 76, men = 63). The overall absolute difference between the 65–69 age group and the 85+ age group was 155% (women = 162%, men = 130%), or 76 more events per person in the older group (women = 82, men = 61). Women averaged more events per person than men, as well as greater percentage differences by age. Drugs and diagnostics account for the majority of events. Only MRI and specialist visits were not higher among the older age groups.

Conclusions At the population level, overall health care utilization would appear to increase significantly with age. It is unclear whether increasing health care utilization prevents morbidity, decreases mortality, or improves quality of life.

Introduction
Unprecedented growth of the elderly population – from 6.9% to 12.0% of the overall global population – will precipitate a dramatic increase in the prevalence of chronic disease [1,2]. At the population level, this trend is expected to result in greater disability and greater demand for health services [1].

In the mid 1990s, research showed that it is not the ageing of our population that threatens health care systems, but rather the continuing increase in per capita utilization [3]. A decade on, there are growing concerns about the quality of care and the availability of care for the elderly [4]. The population of primary care doctors is itself ageing, and as they retire more elderly patients will find themselves without a doctor [5–7]. Of course, most of the developing world already suffers from an acute shortage of doctors so, taken together, these trends point to a much bigger global problem.

There is growing recognition of the need to evaluate how health care services are delivered and received, and how the health care system might best be enhanced to meet the health needs of an ageing population [8–10]. It is increasingly important to understand the burden on the health care system at a population level and to develop measures to evaluate trends and outcomes.

To our knowledge, few published studies have examined overall health care service utilization rates across delineated age groups within the elderly population. The specific objective of this study is to conduct a descriptive analysis of patterns of health care service utilization among the elderly.
Methods

Design

We conducted a population-based retrospective cohort study to examine health care service utilization rates over a 1-year period (1 April 2005 to 31 March 2006). All Ontario residents aged 65 years and over who were eligible for health coverage were included in the analysis. The total sample comprises approximately 1.6 million residents.

Data sources

Five data sources were used to conduct the analysis: (1) Ontario Health Insurance Plan (OHIP) database, (2) Ontario Drug Benefit (ODB) prescription claims database, (3) Canadian Institute for Health Information (CIHI) database, (4) Ontario Registered Persons Database (RPDB), and (5) Statistics Canada census database.

Study cohort

All Ontario residents 65 years of age or older who had at least one OHIP, ODB or CIHI claim during the period from 1 April 2005 to 31 March 2006 were included in the study. Services provided to patients without valid OHIP numbers and/or out-of-province patients were excluded from the analysis. Patient health care numbers were used to identify age and sex from the Registered Persons Database. Claims were grouped by sex and 5-year age intervals. Population data from Statistics Canada were used in the calculation of age- and sex-specific rates. Table 1 presents the age distribution of Ontario residents aged 65+ years for 2005.

Variables

The OHIP claims database covers all claims made by fee-for-service doctors, community-based laboratories and radiological facilities paid by the Ontario Ministry of Health. All OHIP fee codes claimed were reviewed to identify consultations, examinations and procedures. Office visits to family physician (FP)/general practitioner or specialists were based on the doctor’s specialty and visits located in the doctor’s office. Fee codes for inpatient care, nursing home care, inpatient and outpatient laboratory testing, surgical procedures and radiological examinations were excluded. For all doctor types, multiple fee codes billed by the same doctor on the same day were counted as one visit. Emergency Department (ED) visits were extracted for the entire study population using an algorithm developed at the Institute for Clinical Evaluative Sciences. Fee codes were also used to identify X-rays (including diagnostic X-rays), MRI and CT scans, limited to one scan per patient per day. Inpatient MRI scans were excluded because they are covered by hospital global budgets and not billed to OHIP. All laboratory procedures or tests performed during our study period were also included in the analysis.

The ODB prescription claims database contains information on outpatient prescription drug use and costs for all residents over 65 years of age in Ontario. Ontario residents may fill prescriptions at any pharmacy within the province. Data from the CIHI were used to determine the number of inpatient admissions. The CIHI discharge abstract database contains clinical administrative data relating to the health care services provided to patients by all hospital facilities in Ontario.

Our measure of total utilization events was computed by summing all utilization events occurring during the study period (i.e. FP visits, specialist physician visits, ED visits, inpatient admissions, drug claims, lab claims, X-rays, CT scans and MRI scans).

Results

Overall, the mean number of utilization events for Ontarians aged 65+ years for the 1-year study period was 70.3 events (women = 75.7; men = 63.4). Comparing across age groups (see Fig. 1), the total number of events per person was 20% higher for 70–74 than for 65–69, 22% higher for 75–79 than for 70–74, 25% higher for 80–84 compared with 75–79, and finally, 40% higher for 85+ than for 80–84. Total service utilization by those 85+ (mean = 124.8 events) was 2.5 times that for the 65–69 age group (48.9 events), a mean per capita difference of 76 events (women = 82; men = 61). Mean utilization was significantly higher among women than men for every age group (see Table 2).

Drug claims accounted for a large proportion of overall utilization (53.5%). Mean per capita drug claims was 37.6 (women = 42.8; men = 30.9) (see Fig. 2). The absolute difference between the 65–69 age group and the 85+ age group was 346%.

Table 1 Age and gender distribution of the elderly population, Ontario, 2005

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>Female (n)</th>
<th>Male (n)</th>
<th>Total (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>65–69</td>
<td>237 673</td>
<td>218 295</td>
<td>455 968</td>
</tr>
<tr>
<td>70–74</td>
<td>212 267</td>
<td>187 524</td>
<td>399 791</td>
</tr>
<tr>
<td>75–79</td>
<td>187 206</td>
<td>146 614</td>
<td>333 820</td>
</tr>
<tr>
<td>80–84</td>
<td>147 749</td>
<td>94 118</td>
<td>241 867</td>
</tr>
<tr>
<td>85+</td>
<td>121 766</td>
<td>55 486</td>
<td>177 252</td>
</tr>
<tr>
<td>Total</td>
<td>906 661</td>
<td>702 037</td>
<td>1 608 698</td>
</tr>
</tbody>
</table>

Figure 1 Mean utilization events by age and sex, Ontario, 2005/06.
Diagnostic laboratory claims accounted for slightly less than one-third of overall utilization (30.0%). Mean per capita laboratory claims was 21.1 (women = 21.3; men = 20.7). The absolute difference between the 65–69 age group and the 85+ age group was 58% (women = 54%; men = 62%), or 9.9 more lab claims (women = 9.5; men = 10.5).

The FP office visits accounted for 9.0% of overall utilization. The mean number of visits was 6.3 per capita (women = 6.4; men = 6.1). The absolute difference from the 65–69 age group to the 85+ age group was 10% (women = 3%; men = 21%), or 0.6 more FP office visits (women = 0.2; men = 1.2).

Specialist office visits account for 4.6% of overall utilization. The mean number of visits was 3.2 per capita (women = 3.0; men = 3.5). The absolute difference between the 65–69 age group and the 85+ age group was –12% (women = –21%; men = +9%), or 0.34 fewer specialist visits (women = –0.6; men = +0.3). Specialist visits decrease dramatically from the 75–79 to the 85+ age group after increasing linearly from 65–69 to 70–74.

The ED visits accounted for 1.0% of overall utilization. The mean number of visits was 0.70 per person (women = 0.69; men = 0.71). The absolute difference between the 65–69 age group and the 85+ age group was 136% (women = 130%; men = 153%), or 0.66 more ED visits (women = 0.62; men = 0.77).

X-ray utilization accounted for 1.4% of overall utilization. The mean number of X-rays per person was 1.02 (women = 1.04; men = 1.00). The absolute difference between the 65–69 age group and the 85+ age group was 14% (women = 12%; men = 18%), or 0.14 more X-rays (women = 0.12; men = 0.18).

Hospital admissions accounted for 0.33% of overall utilization. The mean number of hospital admissions per person was 0.23 (women = 0.21; men = 0.25). The absolute difference between the 65–69 age group and the 85+ age group was 188%...
Table 3 Per cent change in number of health care services delivered per person aged 65 and older, in Ontario, 2005/06

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>Drug claims (%)</th>
<th>Lab claims (%)</th>
<th>Family physician visits (%)</th>
<th>Specialist visits (%)</th>
<th>ED visits (%)</th>
<th>X-rays (%)</th>
<th>Inpatient admissions (%)</th>
<th>CT scans (%)</th>
<th>MRI scans (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>65–69 to 70–74</td>
<td>36.6</td>
<td>16.0</td>
<td>3.6</td>
<td>10.5</td>
<td>19.3</td>
<td>–0.2</td>
<td>34.8</td>
<td>25.4</td>
<td>–3.6</td>
</tr>
<tr>
<td>70–74</td>
<td>36.4</td>
<td>10.8</td>
<td>6.9</td>
<td>9.5</td>
<td>26.0</td>
<td>2.2</td>
<td>32.1</td>
<td>19.9</td>
<td>–8.5</td>
</tr>
<tr>
<td>75–79</td>
<td>42.7</td>
<td>7.8</td>
<td>3.4</td>
<td>–3.6</td>
<td>26.2</td>
<td>2.7</td>
<td>24.5</td>
<td>8.6</td>
<td>–25.8</td>
</tr>
<tr>
<td>80–84</td>
<td>67.7</td>
<td>13.8</td>
<td>–3.9</td>
<td>–24.2</td>
<td>24.2</td>
<td>9.2</td>
<td>30.0</td>
<td>–3.0</td>
<td>–52.6</td>
</tr>
<tr>
<td>85+</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
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</table>

ED visit, Emergency Department visit.

Discussion

These data indicate dramatic differences in health services utilization among the elderly. The magnitudes are substantial and indicate high demands on patients and their families, on professional health care providers and on the health care system itself. The results present a map of greater interaction with and dependency on the health care system with advancing age. Drugs and diagnostics account for the greatest proportion of events.

Strengths and weaknesses

There are very few published peer-reviewed studies examining the association between age and health care service utilization rates at a population level. The present study uses a large sample with reliable database linkages for a comprehensive array of indicators of health service utilization.

There are several potential limitations with our study. The OHIP database includes only fee-for-service claims, therefore, doctors and patients enrolled in alternative payment plans, who are still in the minority, were not captured, nor were utilization events within other significant sectors of the Ontario health care system (e.g. chronic care/long-term care, home care, physiotherapy, etc.). Exclusion of these services leads to an underestimation of overall utilization of services. Utilization variables were not weighted to account for the fact that a visit to the ED is more costly to the system than is a visit to a FP. Also, although this study assumes independence of date, patients often schedule multiple appointments on the same day so as to minimize the total number of trips.

Comparison with previous studies

This is a comprehensive population-level analysis of the health care utilization of Ontario seniors. Although direct comparisons are difficult because of the measures used, previous research has indicated that increasing age is associated with increased utilization of drugs [11–14], hospital visits [12,14–16], FP visits [12–14,16–20], X-rays, lab and diagnostic tests [17], ED visits [12,21,22] and CT scans [23].

Consistent with previous studies, MRI scans and specialist visits were not higher among the older age groups [23]. This may be due to these events occurring during inpatient hospitalization or in the ED, which were not included in these data. Another possible explanation could be the tacit choice by doctors to limit scarce and expensive resources for something perceived as having little or no benefit [24,25].

The rates and magnitudes of health service utilization in all previous studies were lower than the present data. Several of the prior studies were based on interviews and surveys with relatively small sample sizes, and there are additional limitations associated with self-reported data. The vast majority of previous studies included fewer age categories within the elderly population, and most were restricted to utilization of far fewer health care services.

The present data indicate that accessing health services constitutes a substantial investment in time by older individuals often reliant on others to assist them in attending care facilities. The striking increase in medication use gives rise to concerns regarding medication interactions, adherence and safety [26–28]. Further, the results raise questions about the ultimate goal of health care. Clearly, such large increases in health service utilization do not improve outcomes in any straightforward way as mortality increases at the same rate as utilization [29]. It remains an open question whether the extensive use of health care services impacts morbidity or quality of life.

Implications and next steps

The observed higher utilization among the oldest is likely associated with greater prevalence of chronic disease and multimorbidity. As many chronic diseases are preventable, a long-term strategy with a stronger preventive emphasis for preventing and managing chronic disease is needed [30]. The health care system is currently...
designed for acute care and cure models that are not appropriate for complex chronic conditions [31]. Long-term population health strategies should be devised both to redesign health care systems toward chronic care and to enhance self-management programmes for chronic disease.

The high levels of service utilization further indicate high demands on patients, their families and on health care providers. Thus, health human resources also ought to be something to plan and prepare for within families, and by health care providers. Future studies should exam utilization rates weighing the different health care services. Analysis of utilization by date – for example, the number of events per 24 h – would further contribute to our understanding of life course health service utilization patterns.

In conclusion, this descriptive study represents a significant advancement in our understanding of current patterns of health service utilization among the elderly. At a population level, overall health care utilization increases significantly with age; however, it remains unclear whether this observed greater utilization prevents morbidity, decreases mortality, or increases quality of life.

Acknowledgements

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Details of contributors and name of guarantor

J.N. and L.W. performed the literature search, collected and analyzed the data, and wrote the paper. L.W. and R.M. were involved in data processing and performed the statistical analysis. S.T. and R.M. were involved in the planning and writing of the paper, advised on subsequent revisions and preparation of the final draft. R.U. sought funding for, was responsible for the design and conception of the study, supervised data collection, assisted in writing and is the guarantor of the paper. All authors approved the final version.

Ethics approval

This study was approved by the Research Ethics Board of Sunnybrook Health Sciences Centre, project # 294–2006.

References


