Multimorbidity and Hospitalization Outcomes Over One Year

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HSPRN health system performance research network

OBJECTIVES

Multimorbidity is the co-occurrence of 2 or more medical conditions but where none act as a central or primary diagnosis. Multimorbidity increases the complexity of patient care and has been found to be associated with increased health services use independent of age. This will pose particular challenges for the health system's ability to meet the three components of the Triple Aim (population health, patient experience, and costs).

This study is part of a panel of projects to describe the burden of multimorbidity in Ontario. Our specific objective is to quantify hospitalization use over one-year among individuals with increasing degree of multimorbidity.

DATA SOURCES & STUDY POPULATION

Data sources included but were not limited to:

- CIHI Discharge Abstract Database: for inpatient hospitalization records
- Ontario Health Insurance Plan claims: for physician billings
- Registered Persons Database: for basic demographics
- ICES validated disease cohorts derived from administrative record

The **study population** included all eligible Ontario residents who met the following criteria on April 1, 2009:

- aged 18 to 105 years; and
- at least one of the following conditions: cardiac arrhythmia, acute myocardial infarction, hypertension, chronic coronary syndrome, congestive heart failure, stroke, asthma, chronic obstructive pulmonary disorder, diabetes, osteoporosis, rheumatoid arthritis, osteo- and other arthritis, depression, dementia, cancer, or renal failure.

Cohort size in 2009: 6,639,089

MEASURES & ANALYSES

Measures

- Main outcome: Hospitalization
  - Individuals with ≥ 1 hospitalization in the year
  - Total number of hospitalizations in the year
- Hospitalization descriptors:
  - Length of stay (days)
  - Alternate Level of Care designation – days when no longer considered to require acute care but unable to be discharged
  - Death at discharge
  - 30-day readmission – from any hospitalization; only among those discharged alive

Analyses

- Age-adjusted hospitalization and death rates stratified by sex
- Descriptive characterization of hospitalizations by age group

RESULTS

Figure 1: Age-adjusted hospitalization rates over one year among individuals with ≥ 1 chronic condition

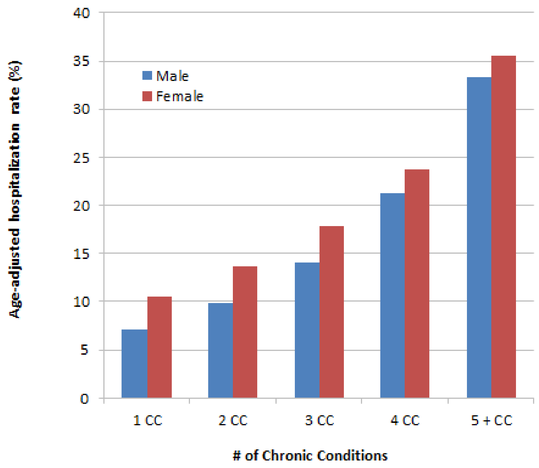

Figure 2: Age adjusted death rates over one year among individuals with ≥ 1 chronic condition

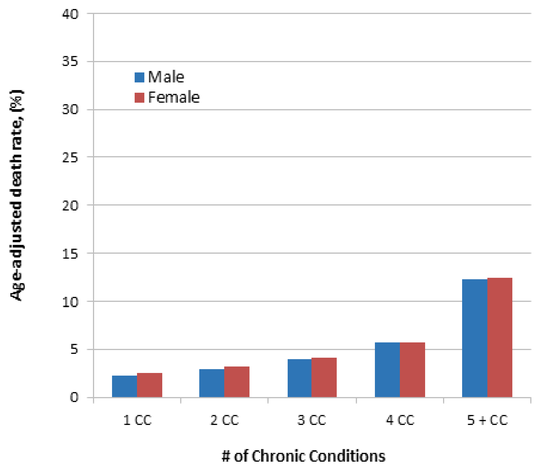

Table 1: Hospitalizations over one year among individuals 18-64 years

	1 CC	2 CC	3 CC	4 CC	5 + CC	Total
Number of individuals with a hospitalization	200,709	118,167	63,003	31,184	24,882	437,945
Number of hospitalizations, N (%)						
1 hospitalization	164,652 (82%)	90,451 (76.5%)	44,768 (71.1%)	20,421 (65.5%)	13,576 (54.6%)	333,868 (76.2%)
2 hospitalizations	25,364 (12.6%)	18,149 (15.4%)	11,246 (17.8%)	6,162 (19.8%)	5,432 (21.8%)	66,353 (15.2%)
3 or more hospitalizations	10,693 (5.3%)	9,567 (8.1%)	6,989 (11.1%)	4,601 (14.8%)	5,874 (23.6%)	37,724 (8.6%)
Total number of hospitalizations	**257,196**	**164,916**	**96,272**	**52,266**	**51,445**	**622,095**
Number of hospitalizations per individual (among those with at least one hospitalization)						
Mean (SD)	1.28 (0.83)	1.40 (1.02)	1.53 (1.21)	1.68 (1.50)	2.07 (1.96)	1.42 (1.10)
Median (Q1 – Q3)	1 (1-1)	1 (1-1)	1 (1-2)	1 (1-2)	1 (1-2)	1 (1-1)
Length of Stay, Days						
Total hospital days, Days	1,028,726	812,295	559,639	341,351	408,675	3,150,686
Hospital length of stay, Days						
Mean (SD)	5.13 (12.40)	6.87 (18.27)	8.88 (21.94)	10.95 (23.81)	16.42 (23.88)	7.19 (18.54)
Median (Q1 – Q3)	3 (1-4)	3 (2-6)	4 (2-8)	4 (2-10)	6 (3-16)	3(2-6)
Alternate Level of Care						
Total ALC days, Days	61,767	67,728	56,178	36,113	56,990	278,776
Any ALC days, N (%)	3,401 (1.3%)	3,425 (2.1%)	2,737 (2.8%)	1,781 (3.4%)	2,208 (4.3%)	13,552 (2.2%)
Discharge due to death						
N (%)	3,750 (1.9%)	3,574 (3.1%)	2,677 (4.4%)	1,813 (6.2%)	2,190 (9.7%)	14,004 (3.3%)
Any 30-day rehospitalization (among those discharged alive)						
N (%)	14,082 (7.1%)	11,020 (9.6%)	7,265 (12%)	4,334 (14.8%)	5,044 (22.2%)	41,745 (9.8%)

Table 2: Hospitalizations over one year among Individuals 65+ years

	1 CC	2 CC	3 CC	4 CC	5 + CC	Total
Number of individuals with a hospitalization	44,658	80,391	91,044	77,376	119,880	413,349
Number of hospitalizations, N (%)						
1 hospitalization	31,877 (71.4%)	55,504 (69%)	60,204 (66.1%)	48,415 (62.6%)	64,816 (54.1%)	260,816 (63.1%)
2 hospitalizations	8,404 (18.8%)	16,000 (19.9%)	19,195 (21.1%)	17,241 (22.3%)	28,804 (24%)	89,644 (21.7%)
3 or more hospitalizations	4,377 (9.8%)	8,887 (11.1%)	11,645 (12.8%)	11,720 (15.1%)	26,260 (21.9%)	62,889 (15.2%)
Total number of hospitalizations	**64,820**	**120,388**	**142,529**	**127,566**	**229,607**	**684,910**
Number of hospitalizations per individual (among those with at least one hospitalization)						
Mean (SD)	1.45 (0.91)	1.50 (0.96)	1.57 (1.05)	1.65 (1.13)	1.92 (1.44)	1.66 (1.18)
Median (Q1- Q3)	1 (1-2)	1 (1-2)	1 (1-2)	1 (1-2)	1 (1-2)	1 (1-2)
Length of Stay, Days						
Total hospital days, Days	551,776	1,053,103	1,313,297	1,236,721	2,420,895	6,575,792
Hospital length of stay, Days						
Mean (SD)	12.36 (23.28)	13.10 (25.70)	14.42 (26.46)	15.98 (27.46)	20.19 (33.38)	15.91 (28.53)
Median (Q1 - Q3)	6 (3-13)	6 (3-14)	7 (3-15)	7 (3-18)	10 (4-23)	7 (3-17)
Alternate Level of Care						
Total ALC days, Days	128,028	251,488	319,104	303,534	602,824	1,604,978
Any ALC days, N (%)	6,082 (9.4%)	11,656 (9.7%)	14,816 (10.4%)	14,084 (11%)	26,056 (11.3%)	72,694 (10.6%)
Discharge due to death						
N (%)	4,725 (11.8%)	9,196 (12.9%)	11,751 (14.8%)	11,476 (17.4%)	24,577 (25.8%)	61,725 (17.6%)
Any 30-day rehospitalization (among those discharged alive)						
N (%)	4,879 (12.2%)	9,512 (13.4%)	11,945 (15.1%)	11,452 (17.4%)	23,564 (24.7%)	61,352 (17.4%)

KEY FINDINGS

Age-adjusted hospitalization and death rates increased with the degree of multimorbidity.

- There was a higher rate of hospitalization among women than men regardless of multimorbidity; however, there was a greater increase in hospitalization rates among men as multimorbidity increased (3.5-fold for women vs. 5-fold for men).
- The death rate also increased with the degree of multimorbidity but did not differ by sex.

Multimorbidity was associated with poorer hospitalization outcomes.

- Mean overall length of stay tripled with the degree of multimorbidity and the proportion discharged due to death increased 5-fold.
- The overall proportion readmitted within 30 days more than doubled among those with 5+ conditions compared to those with only 1.

The effect of multimorbidity appeared to be moderated by age. There were more hospitalizations and poorer outcomes in older adults but the changes with degree of multimorbidity were more marked for younger adults.

- Those 18-64 years showed a steeper increase on nearly all outcomes with increasing morbidity than did those 65+ years.

IMPLICATIONS

The degree of multimorbidity is independently associated with increased hospital utilization and poor outcomes. Although multimorbidity is more common among older adults, our findings suggest that the impact of multimorbidity may be more pronounced among younger adults. These findings highlight the need for better management of multiple chronic conditions, including patient-centred care models, and that individuals younger than 65 years should be targeted.

These findings also highlight the need for further research to better parse out the components of multimorbidity that contribute to increased health services utilization including particular combinations of conditions, the modifying effects of age and sex, and the influence of other factors such as the social determinants of health.

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