
The Relationship between Multimorbidity and Concordant and Discordant Causes of Hospital Readmission at 30 Days and One Year

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Multimorbidity and Readmissions

- Rates of hospital readmission increase with the number of comorbid conditions.
- Patients admitted to the hospital for common conditions including HF, COPD, AMI, and Hip Fracture often have multiple chronic conditions.
- Causes of readmission include readmissions for the index condition, concordant comorbidities (dx related to index condition), or discordant comorbidities (dx unrelated to index condition).
- A better understanding of the causes of readmission can inform the development of interventions to reduce the rates of potentially avoidable readmissions.

Readmission Rates at 30 days and One Year

- Thirty day readmission rates reflect hospital care and care transitions
- One year readmission rates reflect chronic disease management in the community.
- Prior research has focused primarily on 30 day readmissions.
- However, success of payment innovations aimed at integrating care such as Health Links in Ontario ACOs and PCMHs in the US will require reducing hospital readmission rates in a defined population over time.
- Therefore, a better understanding of causes of readmission at one year are needed.

Study Objectives

- To determine causes of readmission at 30 days and one year after an index admission for AMI, HF, COPD, or Hip Fracture
- To assess whether reasons for readmission differ at 30 days and one year
- To determine the relative contribution of concordant and discordant comorbidities to hospital readmissions

Methods

- A longitudinal cohort study patients discharged after an index hospitalization in FY 2011 and 2012 for of acute myocardial infarction (AMI), congestive heart failure (HF), chronic obstructive pulmonary disease (COPD) and hip fracture was conducted using linked population-based data from Ontario, Canada
- **Inclusion criteria:** All adults with first hospital admission with a most responsible diagnosis of AMI and HF in FY 2011 and 2012.
- **Exclusion criteria:** At the time of index admission age ≤ 19 or >105 ; invalid IKN; invalid/missing data on age, sex or date of death; not eligible for Ontario healthcare benefits in previous 3 years; not an Ontario resident at the index event; patients transferred from another institution when index event was not the 1st admission of the episode of care; patient admitted from long term care, complex Chronic Care (CCC) or rehabilitation hospital.

Methods

- Causes of readmission were determined for first readmission at 1-30 days and all readmissions 31-365 days using ICD-10 CA codes for most responsible diagnosis.
- ICD-10 CA codes were grouped as disease-specific, concordant (readmission diagnosis related to index condition), and discordant (readmission diagnosis unrelated to index condition)
- Context: > 95% PCP, large investment in Family Health Teams, fragmented system

Baseline Characteristics

n	AMI	HF	COPD	Hip Fx
n	29,607	20,095	22,809	12,857
Age				
46-64	41.0%	15.0%	23.2%	11.6%
65-74	21.4%	20.7%	28.3%	15.4%
75-84	20.5%	35.4%	32.8%	35.2%
85+	11.4%	27.1%	14.1%	35.6%
Female	33.2%	47.5%	50.2%	69.9%

Baseline Characteristics

30 day readmissions	AMI	HF	COPD	Hip Fx
1	10.3%	16.6%	13.4%	6.4%
2	1.0%	1.8%	1.2%	0.3%
3 or more	0.1%	0.1%	0.1%	0.01%
1 yr readmissions				
0	68.5%	42.5%	48.7%	71.1%
1	19.6%	29.0%	26.6%	20.1%
2	6.9%	14.5%	12.6%	5.9%
3	2.8%	7.2%	5.7%	1.9%
4 or more	2.3%	6.9%	6.4%	1.0%

Discordant Causes of Readmission HF

30 Days	31-365 Days
Geriatric Conditions	COPD/related
GI disease	Infection excluding Pneumonia
Renal disease	GI disease
COPD/related	Pneumonia
Infection excluding Pneumonia	Geriatric Conditions
Pneumonia	Renal disease
Other respiratory disorders	Diabetes
Genitourinary disorders	Other respiratory disorders
Diabetes	Genitourinary disorders
Cancer	HIP and Fragility Fractures
GI bleed	Cancer
HIP and Fragility Fractures	GI bleed

CHF: Causes of Readmission at 30 Days and One Year*

	30 days n=3715	31-365 days n=18796
HF Pulmonary Edema	40.6%	32.7%
Concordant Comorbidities		
Other Cardiovascular Disease	5.9%	4.5%
Ischemic Heart Disease	4.7%	5.6%
Arrhythmia	4.3%	4.0%
Cardiopulmonary Symptoms	2.0%	1.8%
Cerebrovascular Disease	1.7%	1.9%
	18.5%	17.8%
Discordant Comorbidities		
Geriatric Conditions	4.1%	3.9%
GI Disease	4.1%	4.6%
Renal Disease	3.6%	3.0%
COPD/related	3.5%	5.4%
Infection excluding Pneumonia	3.5%	4.7%
Pneumonia/Lower Respiratory infections	3.1%	4.2%
Other Respiratory Disorders	2.4%	2.3%
Genitourinary Disorders	2.0%	2.2%
Diabetes	1.8%	2.5%
GI Bleed	1.2%	1.2%
HIP and Fragility Fractures	0.9%	1.6%
Other Conditions	9.1%	11.9%
	39.1%	47.6%

* First readmission at 30 days and all readmissions at one year

Hip Fracture: Causes of Readmission at 30 Days and One Year*

	30 days	31-365 days
	n=862	n=4577
	%	%
HIP and Fragility fractures	5.2%	8.4%
Concordant Comorbidities		
Musculoskeletal disorders	2.8%	3.6%
Discordant Comorbidities		
Geriatric Conditions	11.0%	7.9%
GI Disease	10.2%	8.1%
Pneumonia/Lower Respiratory Infections	5.2%	6.5%
Genitourinary Disorders	4.3%	4.0%
CHF/Pulmonary Edema	3.9%	5.2%
Ischemic Heart Disease	3.8%	2.7%
Cerebrovascular Disease	2.8%	3.6%
COPD/COPD related	2.6%	4.4%
Other Cardiovascular Disease	2.6%	3.2%
Arrhythmia	2.2%	2.4%
GI Bleed	1.6%	1.1%
Other Respiratory Disorders	1.5%	1.8%
Renal Disease	1.5%	1.6%
Diabetes	1.0%	1.8%
Cardiopulmonary Symptoms	0.8%	0.9%
Other Conditions	27.7%	22.1%
	#NAME?	84.3%

* First readmission at 30 days and all readmissions at one year

Causes of Readmission

	AMI		HF	
	≤ 30 days	31-365 days	≤ 30 days	31-365 days
	n=3388	n=11950	n=3715	n=18796
Index Condition	30.3%	22.0%	40.6%	32.7%
Concordant Conditions				
	36.3%	30.4%	18.5%	17.8%
Discordant Conditions:				
	33.0%	47.0%	40.5%	49.0%

Causes of Readmission

	COPD		Hip Fracture	
	≤ 30 days	31-365 days	≤ 30 days	31-365 days
	n=3348	n=19800	n=862	n=4577
Index Condition	46.2%	48.2%	5.2%	8.4%
Concordant Conditions				
	6.8%	6.8%	2.8%	3.6%
Discordant Conditions:				
	43.2%	42.3%	87.7%	84.2%

Summary

- After hospital admission for common conditions, discordant comorbidities are responsible for many hospital readmissions.
- The burden of discordant admissions varies across cause of index admission.

Limitations

- Descriptive analyses presented
- Administrative data lacks clinical detail including data on functional status
- In patients with multimorbidity most responsible diagnosis for hospital admission may be unclear

Implications

- Patient-centered models of care to effectively manage multimorbidity will likely be needed needed to reduce rates of potentially avoidable readmissions among older patients
- Improvement interventions that address both the index cause of hospitalization as well as comorbid conditions including geriatric syndromes can potentially reduce these rates.