

Webinar Series
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Sex differences in admission to ICU: exploring the role of social support factors

Allan Garland, MD, MA, BSc
University of Manitoba

Andrea Hill, PhD
Sunnybrook Health Sciences

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Webinar Series

Sex differences in admission to ICU: exploring the role of social support factors

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Carol Barrie
Executive Director



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Network Update



- **Renewal**
 - CFN recently applied to renew our funding for a second five-year term
 - Actively looking for network partners to support Highly Qualified Personnel (HQP) for Interdisciplinary Fellowships and Summer student Programs (SSA) over next five years – requires eligible funds to match CFN funds to support these HQP programs (approx. 4,000 for each SSA and 12,500 to 25,000 for fellow)
 - Contact Carol Barrie for partnership inquiries (carol@cfn-nce.ca)
- **CFN Network News coming soon:**
 - Watch for updates on project competitions awarded and trainees funded in recent competitions



Q-&-A session

- **Follows Dr. Garland and Dr. Hill's presentation**
- **Submit your Qs online during presentation**
- **We will answer as many Qs as time permits**
- **Webinar is recorded and available for viewing online within 1-2 days:**

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Presenters

Sex differences in admission to ICU: exploring the role of social support factors

- **Professor of Medicine and Community Health Sciences at the University of Manitoba**
- **Obtained his BS in Physics at the University of Michigan, his MA in Physics at Harvard and his MD at the University of Chicago**
- **Research interests include the source and magnitude of variation in ICU care, the relationship between structure and outcomes in critical care, long-term patient outcomes and optimal use of vascular access devices, among others**

- **Research Associate at Sunnybrook Health Sciences**
- **Research interests relate to the epidemiology and outcomes of critical illness and injuries**
- **Current work focuses on understanding the determinants of ICU admissions and long-term outcomes among the elderly following critical illness**

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MD, MA, BSc**

Andrea Hill, PhD



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Sex Differences in Admission to Intensive Care Units: Exploring the Role of Social Support Factors



THE UNIVERSITY OF
BRITISH COLUMBIA



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OF MANITOBA



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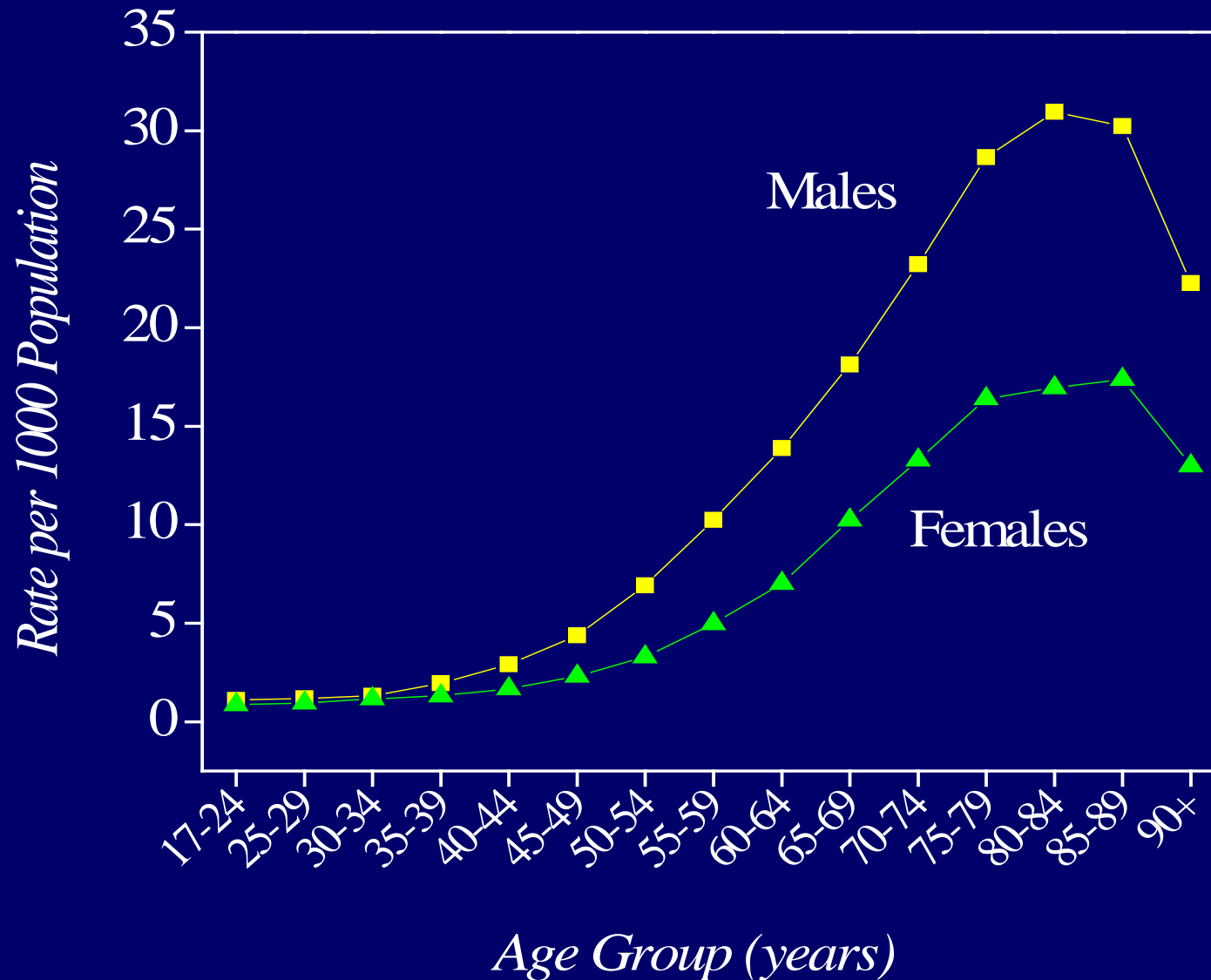
Our Team

- University of Manitoba (1° location of Manitoba data analysis)
 - Allan Garland, Clare Ramsey (co-PIs)
 - Malcolm Doupe, Randy Fransoo
- University of Toronto (1° location of CIHI data analysis)
 - Andrea Hill (HQP -- postdoctoral trainee)
 - Robert Fowler
- University of British Columbia
 - Peter Dodek, Jean Kozak, Hubert Wong (statistician)

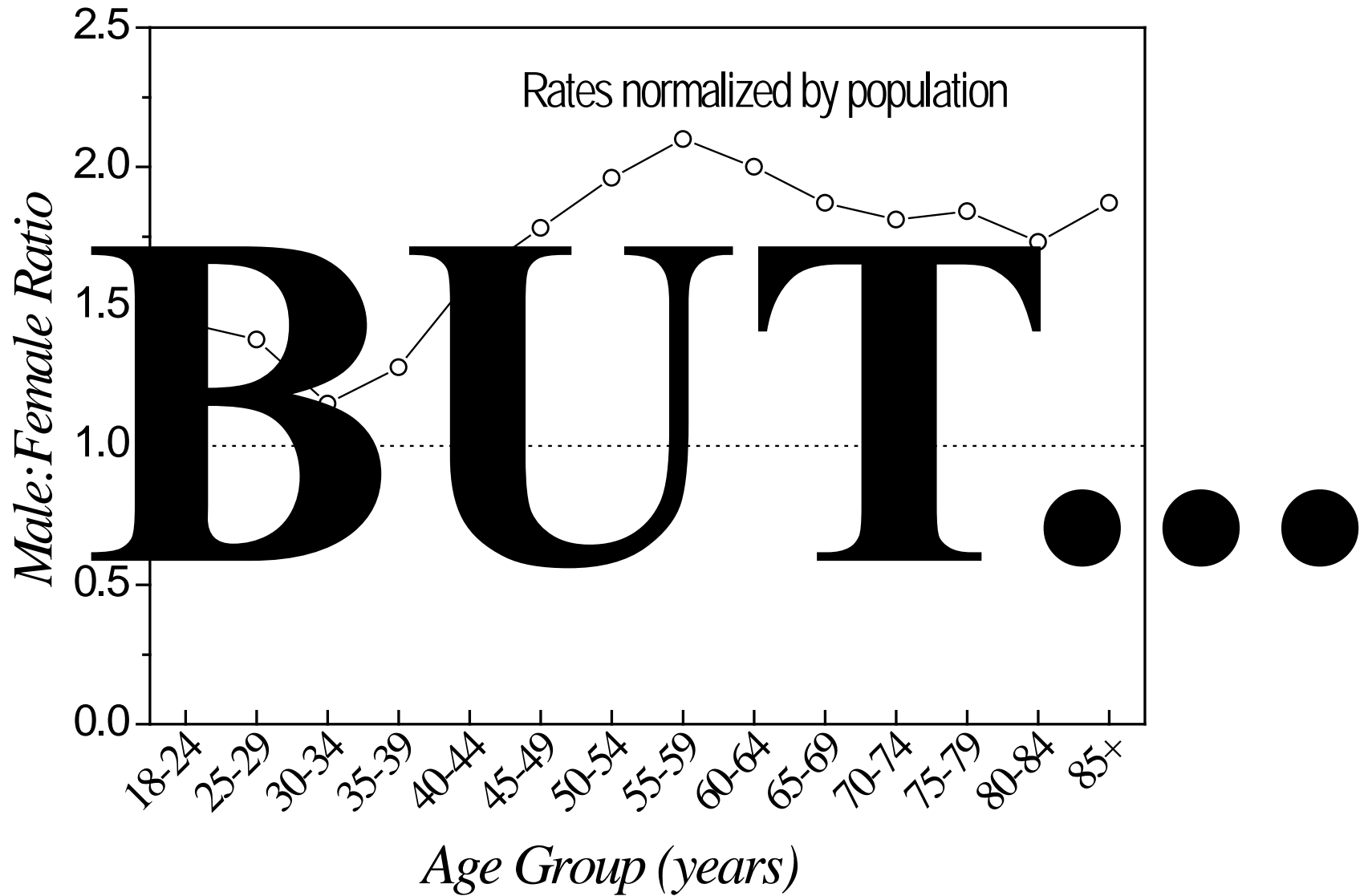
Introduction - 1

- ICUs are a large, important, and expensive part of health care
- **Salient Observation:** Men outnumber women in ICUs ($\approx 60:40$) *everywhere* it has been reported (esp. in Canada)
(Valentin et al, *CCM* 31:1901,2003; Laupland et al, *Crit Care* 8:R431,2004; Fowler et al, *CMAJ*, 177:1513,2007; Dodek et al, *J Crit Care* 24:630.e631,2009; Garland et al, *Crit Care* 17:R212,2013)
 - *except* Olmsted County, MN (Seferian et al, *CCM*, 34(8):2113-2119, 2006)
- Perhaps more relevant, population-based rates of ICU admission are greater for men than women
 - this is not accounted for by sex differences in diagnoses, comorbidities, or SES
- ★ The concern has been raised that these findings represent **gender bias by ICU gatekeepers** (Bierman, *CMAJ* 177(12):1520-1521, 2007)

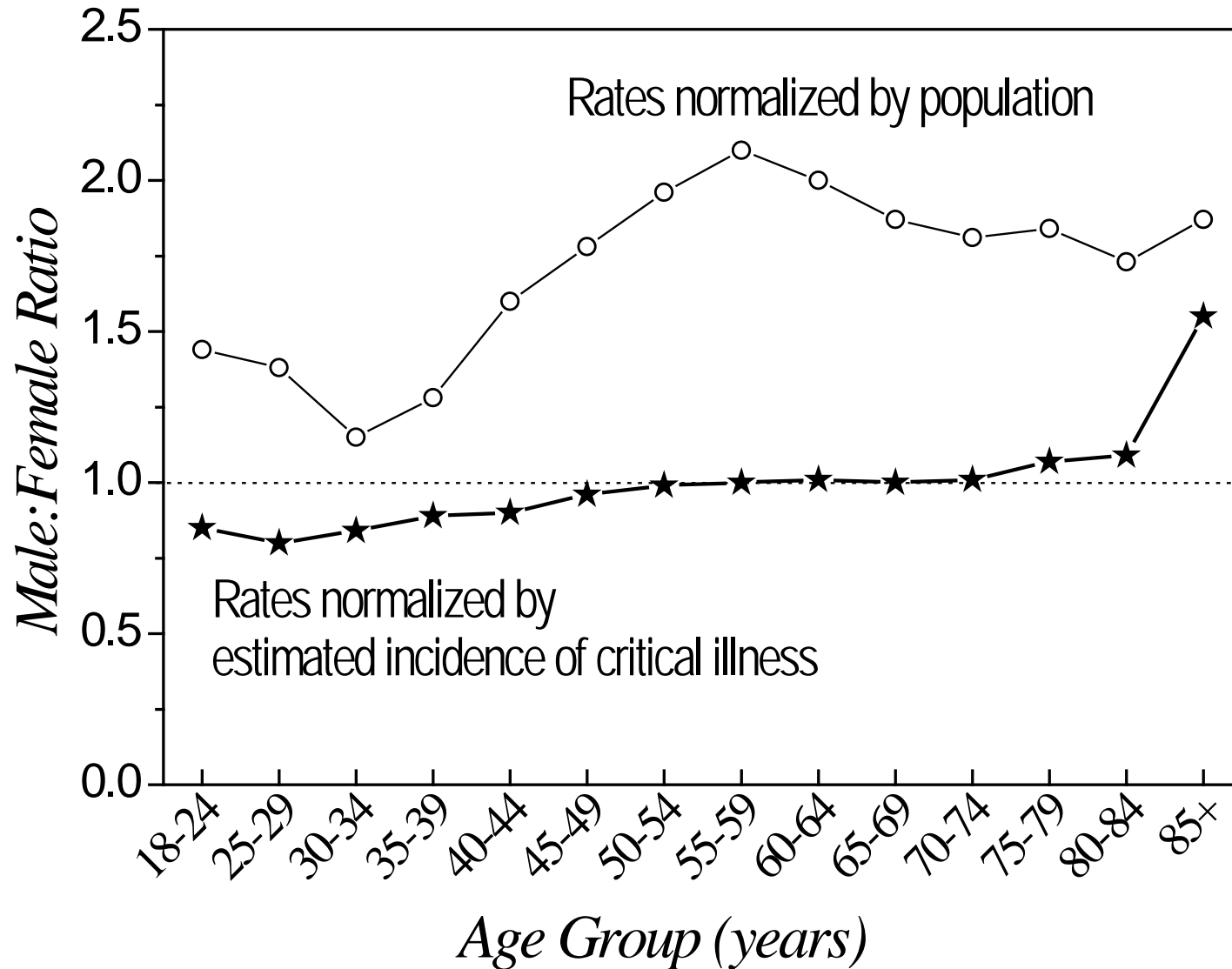
Population-based rates of ICU admissions in Manitoba (average over years 1999-2007)



Ratio of M:F Rates of ICU Admission in MB



Ratio of M:F Rates of ICU Admission in MB



Introduction - 2

- For most ages, higher rates of ICU admission for men are fully explained by higher rates of critical illness among men
 - a difference, but not a disparity in the sense of unfairness
- But for older ages, there appears to be a male predominance in rates of ICU care *not* explained by rates of critical illness
- Such a difference could relate to sex-related differences in:
 - willingness to seek medical care
 - access to the portals to hospital care (outpatient care, EMS, ED)
 - admission to hospital (via gatekeepers)
 - willingness for aggressive medical care as provided in ICUs
 - admission to ICU (via gatekeepers)

Origin of The Idea

- In some other health care domains, willingness for medical care has been found to relate to QOL & social supports
- In regards to critical illness and ICU care:
 - Women generally outlive men ⇒
 - Many/most elderly critically ill women are widowed, while many/most elderly critically ill men still have living spouses ⇒
 - We reasoned that if widowhood reduces willingness to undergo aggressive medical care as provided in ICUs ⇒
 - It could account for at least some of the male predominance of ICU admission among the elderly

Concept Summary

- Differences in elderly patients' wishes regarding ICU admission may be related to differences in social support between the sexes
- Goal: Determine, among people ≥ 65 yrs whether/how the male predominance of ICU care in the elderly is influenced by social supports, prior experience with ICU care, and sociodemographic factors

Study Design - 1

- Parallel analyses on 3 patient cohorts in 2 datasets -- linked administrative hospital abstracts (DAD) to population data
- Manitoba data cohort: everyone ≥ 65 yrs, 2004-2012
 - Canadian hospital abstracts accurately identify ICU care (Garland et al, *Medical Care*. 50:e1-e6,2012)
 - Manitoba administrative data allows for accurate identification of spouses and children
- CIHI data cohorts: ≥ 65 yrs, 2007-2012, two cohorts for which RAI (Resident Assessment Instrument) data exists (ON, AB, BC):
 - nursing home residents; homecare clients
 - RAI contains rich data on social supports and functional status systematically obtained
 - done once at start of homecare; quarterly in nursing homes, where it accurately identifies date of death

Study Design - 2

- Regression modeling of admission to ICU
 - MB, NH cohorts: Cox regression, time from cohort entry to ICU adm.
 - HC cohort: after homecare entry, only know if still alive if admitted to hospital → assess ICU admission among those admitted to hospital → GEE logistic regression of whether hospitalization included admission to ICU
- X-variables:
 - of primary interest: sex, marital status, (kids in MB)
 - others of interest: prior admission to ICU (patient ± spouse)
 - covariates in all 3 cohorts: age, comorbidity, year
 - covariates in some cohort(s): SES, NH residency, ADLs, iADLs, cognitive performance, pain, depression, incontinence, falls, comorbidities, medications, caregiver burden

Study Design - 3

- For the Cox regressions (MB, NH cohorts) -- variables entered as time-dependent covariates, updated when situation changes (e.g. marital status) or yearly
- If a subject survives hospitalization with ICU admission, and returns to prior living situation, he/she begins a new record and is eligible to have the outcome again \Rightarrow clustered data
 - for the two Cox regressions, datasets too large to run models as clustered data version of Cox regression \rightarrow to avoid biasing towards lower age, we report 1 random record/patient unless otherwise stated
 - for the NH cohort, we included all records as clustered (correlated) data, via GEE logistic regression

Subjects at Cohort Entry

|----- cohort -----|

	<i>Manitoba</i>	<i>Nursing home</i>	<i>Homecare</i>
Number of subjects	249,421	210,090	133,978
# admitted to ICU during study, % (n)	5.8% (14,468)	12.8% (26,826)	4.3% (5795)
Age (years), mean±SD	72±8	82±8	84±8
% females	55%	67%	64%
% married	57%	39%	33%
% in ICU prior	11%	12%	13%
% living in nursing home	4%	100%	0%
% with spouse in ICU prior	8%	n.a.	n.a.

Effects of Marriage/Kids On ICU Male Predominance

- Model coefficient of male sex (vs. female)

|----- cohort -----|

<i>Model includes:</i>	MB (HR)	NH (HR)	HC (OR)
Sex, age	1.88*	1.48*	1.14*

Effects of Marriage/Kids On ICU Male Predominance

- Model coefficient of male sex (vs. female)

|----- cohort -----|

<i>Model includes:</i>	MB (HR)	NH (HR)	HC (OR)
Sex, age	1.88*	1.48*	1.14*
Sex, age, all other variables except marital status, kids	1.71*	1.37*	1.12*

Effects of Marriage/Kids On ICU Male Predominance

- Model coefficient of male sex (vs. female)

|-----cohort-----|

<i>Model includes:</i>	MB (HR)	NH (HR)	HC (OR)
Sex, age	1.88*	1.48*	1.14*
Sex, age, all other variables except marital status, kids	1.71*	1.37*	1.12*
Sex, age, all others including marital status (but not kids)	1.78*	1.36*	1.07*

Effects of Marriage/Kids On ICU Male Predominance

- Model coefficient of male sex (vs. female)

|-----cohort-----|

<i>Model includes:</i>	MB (HR)	NH (HR)	HC (OR)
Sex, age	1.88*	1.48*	1.14*
Sex, age, all other variables except marital status, kids	1.71*	1.37*	1.12*
Sex, age, all others including marital status (but not kids)	1.78*	1.36*	1.07*
Sex, age, all others including marital status and kids	1.81*	--	--

- Only in the homecare cohort is there *any* suggestion that the male predominance of ICU care is a consequence of the loss of social support from widowhood (or lack of children, in MB cohort)
- **Our hypothesis** is NOT supported by **our analysis**

Effect of Marital Status Itself on ICU Admission

- Model coefficient of marital status: |----- cohort -----|

<i>Variable</i>	MB (HR)	NH (HR)	HC (OR)
Married, spouse lives at home	1.0		
Married, spouse lives in nursing home	1.10		
Widow	1.16*		
Not married, not widow	1.18*		
Married		1.0	1.0
Widowed/separated/divorced		0.99	0.90*
Never married		0.87	0.84*
Unknown		0.95	0.64*

- In the whole population Manitoba cohort, *not* being married is associated with a higher chance of ending up in an ICU
- In the Nursing Home and Homecare cohorts, there is no suggestion of that effect, if anything, it's the opposite

Findings: Other Associations with ICU Admission

	----- cohort -----		
	<i>Manitoba</i>	<i>Nursing home</i>	<i>Homecare</i>
Older age	↑	↓	↓
More comorbid conditions	↑		↑
Specific comorbid conditions		↑ or ↓	
More medications	↑	↑	↑
Later calendar year	↓	ns	↓
Higher SES	↑		↑
Lives in nursing home	↓		
In ICU during past 1 year	↑	↑	↑
Cognitive impairment		↓	↓
Current depression		↑	↓
Bowel incontinence		↓	ns
Better social engagement		↓	ns
More ADL dependencies		↑	ns
Recent falls		ns	↓
DNR order		↓	

[Blank cell = n.a; ns=not statistically significant effect; Green = interestingly inconsistent findings]

Additional Analysis

- Indirectly evaluate possible reasons for male predominance
 - gatekeeper effect vs. sex difference in personal preferences for aggressive (ICU) care
- Used Manitoba cohort to compare hazard for ICU admission between the 1st and 2nd records
 - 1st record starts at cohort entry (age 65) and ends ICU admission, death, or end of study period (2004-2012)
 - 2nd record starts at discharge alive from first ICU-containing hospitalization
- **Concept:** Expect that if there is a sex bias in gatekeepers' decisions regarding ICU entry, that the male predominance would be present and similar for both 1st and 2nd ICU admissions.

Manitoba Cohort - Additional Analysis

<i>Variable</i>	Hazard Ratio	
	1 st record	2 nd record
Male sex	1.82 *	1.07 ← (95% C.I. = 0.96-1.20)
Age (per year)	1.00	0.99 *
Calendar year	0.87 *	0.89 *
Pt in ICU prior	1.91 *	n.a.
Pt lives in nursing home	0.30 *	0.65 *
<i>Marital status:</i>		
Married, spouse at home	ref	ref
Married, spouse in NH	1.11	0.81
Widow	1.15 *	1.02
Not married, not widow	1.17 *	1.26 *
Spouse in ICU prior	1.03	1.10
SEFI-2 (higher is lower SES)	1.05 *	1.02
<i>Comorbidity measures:</i>		
Charlson score	1.09 *	1.06 *
Hosp-days in prior 5 yrs	1.002 *	1.001
MD visits in prior 1 yr	1.01 *	1.01 *
# Prescription drug categories	1.06 *	1.04 *

Additional Analysis: Interpretation

- The large male predominance of population-based ICU admission rate *disappears* among individuals who were admitted to an ICU during a prior hospitalization
- It seems quite unlikely (but not impossible) that a bias towards admitting men over women to ICU on the part of the physician gatekeepers would only be selectively applied to first episodes of severe illness warranting such care
- Instead, the more likely interpretation is that:
 - overall, older men are more likely to accept aggressive (ICU) care when they become critically ill than are older women → HR=1.82*
 - but, persons who have previously been in an ICU identifies a select subset of men & women who *are willing* to accept such care → restricted to them, there is no significant male predominance, HR=1.07

Manitoba Data: Survival Analysis

- Cox multivariable regression among the 14,468 admitted to ICU
- X-variables -- all those in MB model of ICU admission, plus:
 - ICU admission diagnosis category, APACHE II acute physiology score, Glasgow Coma Scale score, use of 3 types of artificial life support (MV, vasoactive drugs, dialysis), ICU admission timing

<i>Variable</i>	HR	95% C.I.
Male sex	1.15*	1.10-1.21
Age (per year)	1.05	1.05-1.05
<i>Marital status</i>		
Married, spouse at home	1.0	--
Married, spouse in NH	0.86	0.69-1.06
Widow	0.12*	1.05-1.19
Not married, not widow	1.17*	1.10-1.24

- Other significant associations with mortality: more comorbidity, lower SES, higher severity of acute illness, various ICU admitting diagnoses, admission on weekends or evenings

Summary, Conclusions

- Contrary to our hypothesis, this analysis of three separate patient cohorts, the social supports of being married (and having children nearby) does not explain the male predominance of ICU admission
- Although it has been suggested that this male predominance represents gender bias by ICU gatekeepers, our findings are more consistent with it reflecting a generally lesser acceptance of aggressive ICU care among older women vs. older men

End of Data Presentation

Now DISCUSSION

Survey and Future Webinars

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Wednesday, September 7, 2016 at 12 noon ET

Fostering End-of-Life Conversations, Care and Community Among LGBT Older Canadians – results of CFN-funded Catalyst Research Program Grant – Brian de Vries, San Francisco State University and Gloria Gutman, Simon Fraser University

Wednesday, September 21, 2016 at 12 noon ET

Pilot study of MEducation RAationalization intervention – results of CFN-funded Catalyst Research Program Grant – James Downar, University of Toronto

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