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MEDICINE & DENTISTRY
UNIVERSITY OF ALBERTA

FRAILTY Among the Critically Ill

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Objectives



1. Describe the epidemiology of **FRAILTY** in critical illness in Alberta
2. Provide an overview of a **FRAILTY** bedside clinical information (eCritical) implementation project
3. Engagement/solicit feedback

Association between frailty and short- and long-term outcomes among critically ill patients: a multicentre prospective cohort study



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- **Design:**
 - Prospective observational study
- **Setting:**
 - 2 academic + 4 community hospital ICUs
- **Population:**
 - All adult patients (aged ≥ 50 years) admitted to ICU and expected to survive ≥ 24 hours

Association between frailty and short- and long-term outcomes among critically ill patients: a multicentre prospective cohort study



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- **Screening following admission to ICU**
- **After ascertainment of eligibility/consent:**
 - Detailed medical record review
 - Data from patient (surrogate if necessary)
- **Assessment of exposure: Frailty (CFS score)** (pre-hospital)
 - Assessed independently by both coordinators and treating intensivists
- **Outcomes:**
 - **Primary:** *hospital mortality*
 - **Secondary:** *adverse events, death, rehospitalization, and HRQL at 6 and 12 months after index admission*

Clinical Frailty Scale*



1 Very Fit – People who are robust, active, energetic and motivated. These people commonly exercise regularly. They are among the fittest for their age.



2 Well – People who have **no active disease symptoms** but are less fit than category 1. Often, they exercise or are very **active occasionally**, e.g. seasonally.



3 Managing Well – People whose **medical problems are well controlled**, but are **not regularly active** beyond routine walking.



4 Vulnerable – While **not dependent** on others for daily help, often **symptoms limit activities**. A common complaint is being "slowed up", and/or being tired during the day.



5 Mildly Frail – These people often have **more evident slowing**, and need help in **high order IADLs** (finances, transportation, heavy housework, medications). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation and housework.



6 Moderately Frail – People need help with **all outside activities** and with **keeping house**. Inside, they often have problems with stairs and need **help with bathing** and might need minimal assistance (cuing, standby) with dressing.



7 Severely Frail – **Completely dependent for personal care**, from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~ 6 months).



8 Very Severely Frail – Completely dependent, approaching the end of life. Typically, they could not recover even from a minor illness.



9. Terminally Ill - Approaching the end of life. This category applies to people with a **life expectancy <6 months**, who are **not otherwise evidently frail**.

Scoring frailty in people with dementia

The degree of frailty corresponds to the degree of dementia. Common symptoms in mild dementia include forgetting the details of a recent event, though still remembering the event itself, repeating the same question/story and social withdrawal.

In moderate dementia, recent memory is very impaired, even though they seemingly can remember their past life events well. They can do personal care with prompting.

In severe dementia, they cannot do personal care without help.

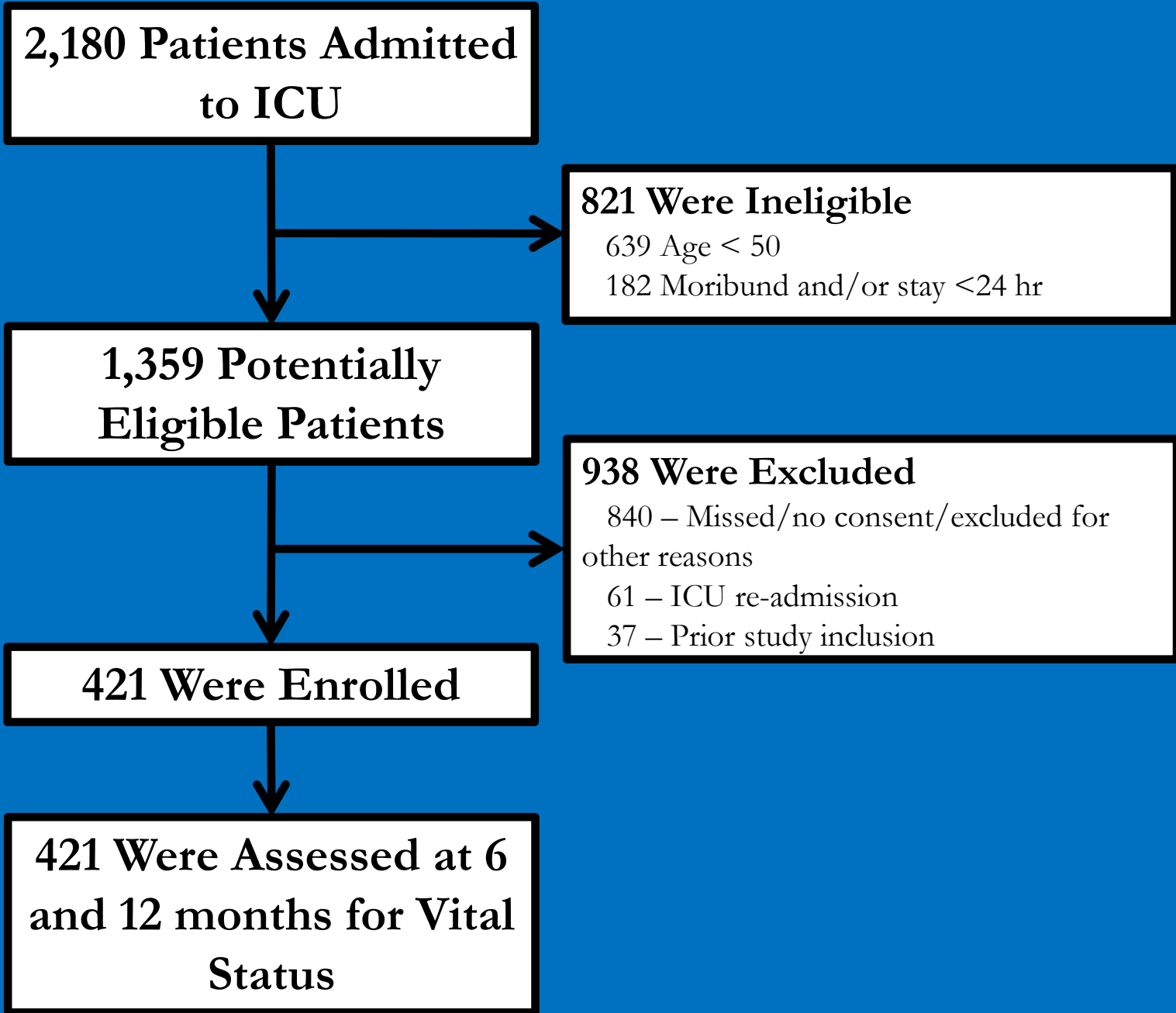
* 1. Canadian Study on Health & Aging, Revised 2008.

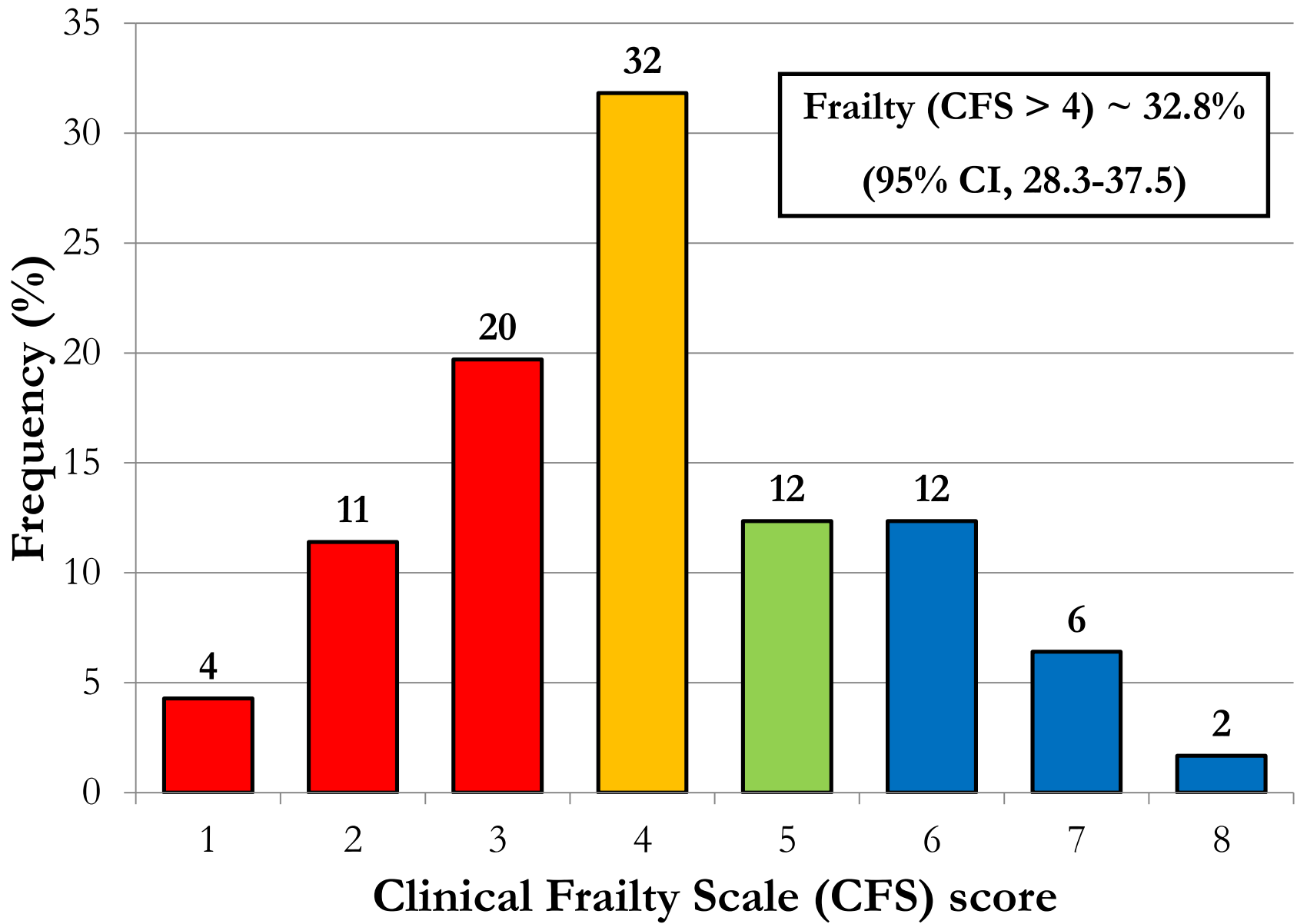
2. K. Rockwood et al. A global clinical measure of fitness and frailty in elderly people. CMAJ 2005; 173:489-495.

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Available at: http://geriatricresearch.medicine.dal.ca/clinical_frailty_scale.htm





Baseline Characteristics



VARIABLE	FRAIL	Not FRAIL	p
Age (yrs)	69.0 (10.1)	66.2 (9.7)	0.007
Female sex (%)	47.8	34.3	0.007
BMI > 30 (kg/m ²)	42.2	33.2	0.08
Widowed (%)	18.2	9.9	0.03
Grades 1-9 only (%)	28.9	19.4	0.06
Elixhauser Comorbidity	9.8 (8.7)	6.7 (7.3)	<0.001
No. Prescription Drugs	8.9 (5)	5.5 (4)	<0.001
Post-Surgical (%)	24.6	38.2	0.006
APACHE II score	21 (7)	19 (7)	<0.0001

VARIABLE	FRAIL	Not FRAIL	p
Pre-Hospital Location (%)			
<i>Independent at home</i>	42.0	86.2	<0.001
<i>At home with assistance</i>	46.4	12.4	<0.001
Independent for ADL¶ (%)			
<i>Dressing</i>	73.9	99.6	<0.001
<i>Walking</i>	55.8	91.5	<0.001
<i>Getting out of bed</i>	68.8	99.6	<0.001
<i>Taking a bath</i>	57.2	96.8	<0.001
<i>Using toilet</i>	83.3	98.6	<0.001
<i>Taking medicine</i>	65.2	95.7	<0.001
<i>Managing own money</i>	73.9	96.8	<0.001
<i>Eating</i>	93.5	99.6	<0.001
Prior hospitalization (1 yr) (%)	56.6	35.1	<0.001

¶ Score of 0 on the CSHA Function scale

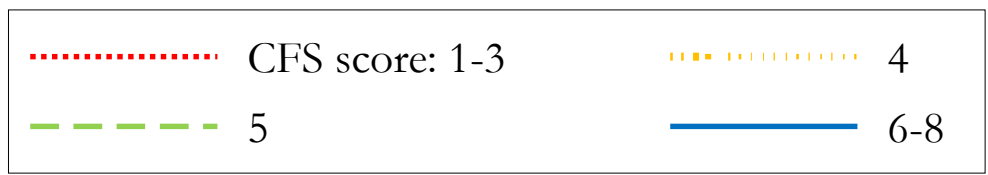
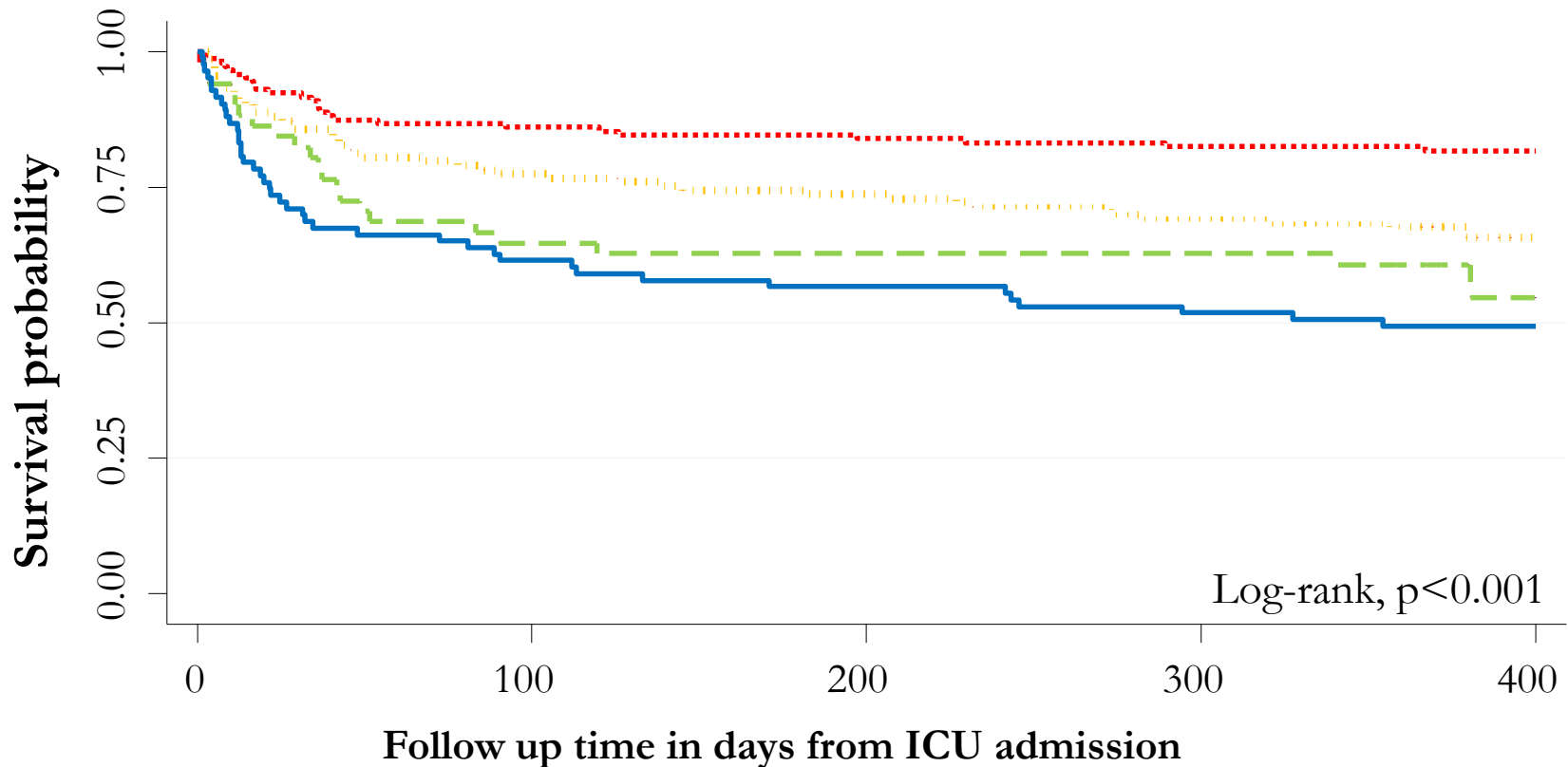
Treatment Intensity and Use of Resources in ICU

Variable	Group; no. (%) of patients		<i>p</i> value*
	Frail <i>n</i> = 138	Not frail <i>n</i> = 283	
Mechanical ventilation	122 (88.4)	240 (84.8)	0.3
Re-intubation	17 (12.3)	30 (10.6)	0.6
Tracheostomy	18 (13.0)	35 (12.4)	0.9
Vasoactive medications	83 (60.1)	146 (51.6)	0.1
Renal replacement therapy	14 (10.1)	33 (11.7)	0.6
Blood transfusion	57 (41.3)	113 (39.9)	0.8
Surgical procedure or re-operation	26 (18.8)	63 (22.3)	0.4

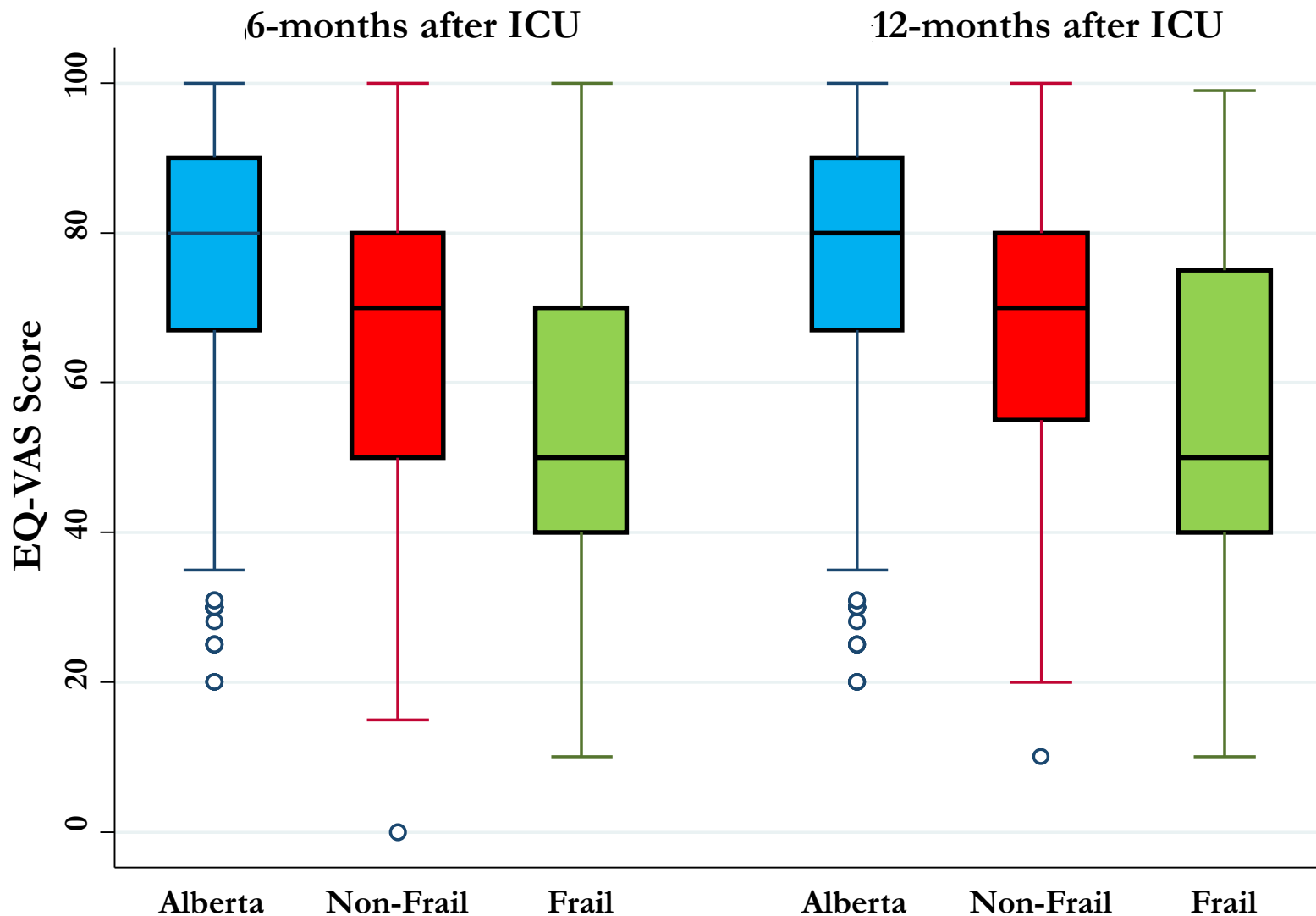
Clinical Outcomes by Frailty Status

Outcome	Group; no. (%) of patients*		Association, OR (95% CI) or difference in medians (<i>p</i> value) ^t
	Frail <i>n</i> = 138	Not frail <i>n</i> = 283	
Adverse event [‡]	54 (39.1)	83 (29.3)	1.54 (1.01–2.37)
Death			
In ICU	16 (11.6)	27 (9.5)	1.37 (0.72–2.62)
In hospital	44 (31.9)	45 (15.9)	1.81 (1.09–3.01)
Duration of stay, d, median (IQR)			
In ICU	7 (4–13)	6 (3–10)	1 d (0.02)
In hospital	30 (10–64)	18 (10–40)	12 d (0.02)
Discharge disposition [§]	<i>n</i> = 91	<i>n</i> = 235	
Home, living independently	20 (22.0)	104 (44.3)	0.35 (0.20–0.61)
Home, living with help	33 (36.3)	58 (24.7)	1.67 (1.00–2.81)
Other [¶]	38 (41.8)	73 (31.1)	1.51 (0.92–2.48)
Discharged newly dependent ^{**}	24 (70.6)	96 (51.6)	2.25 (1.03–4.89)
Hospital readmission [§]	51 (56.0)	92 (39.1)	1.98 (1.22–3.23)

Survival Stratified by CFS Score within 12 months after ICU

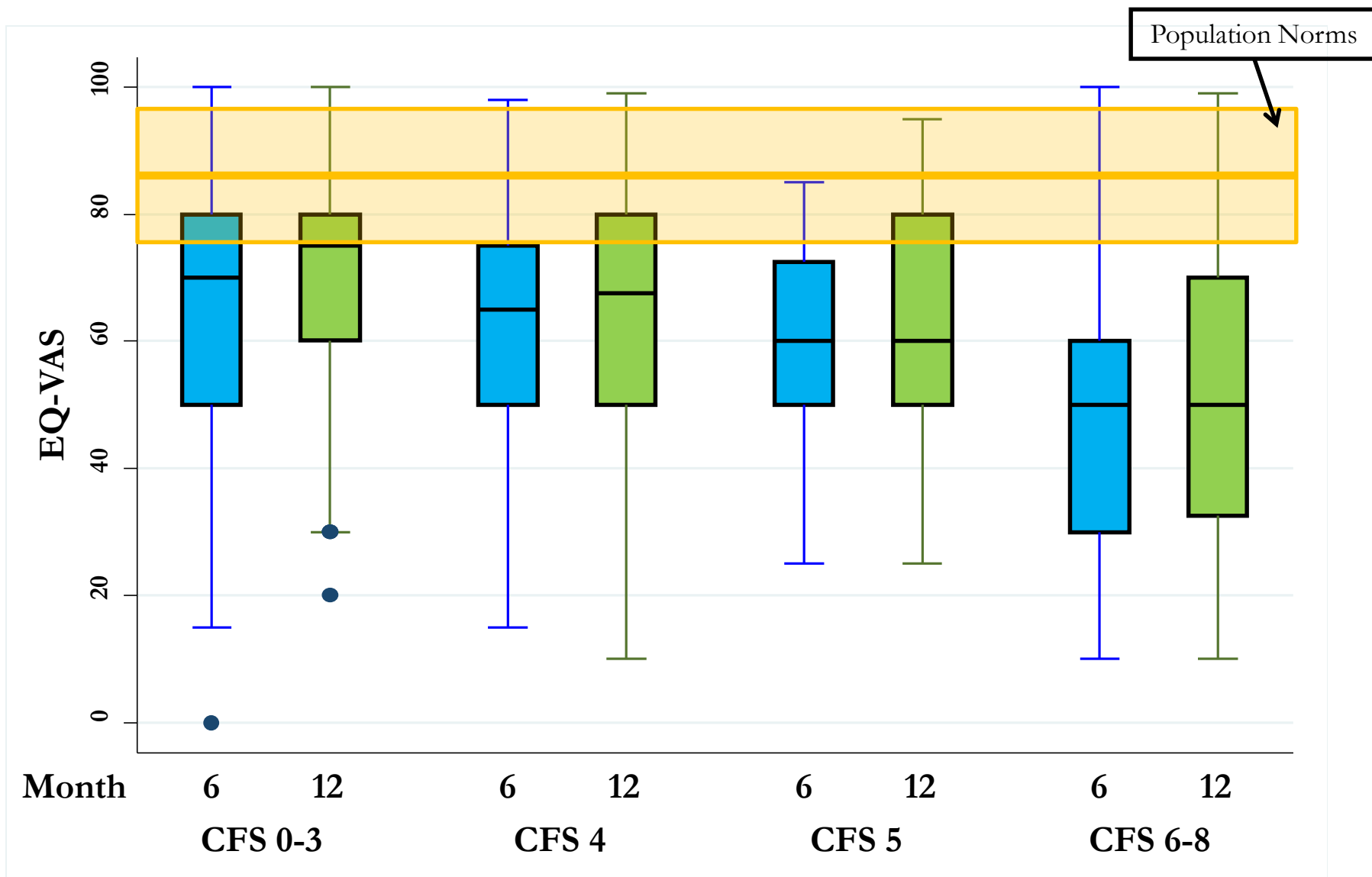


EuroQOL (EQ-VAS)



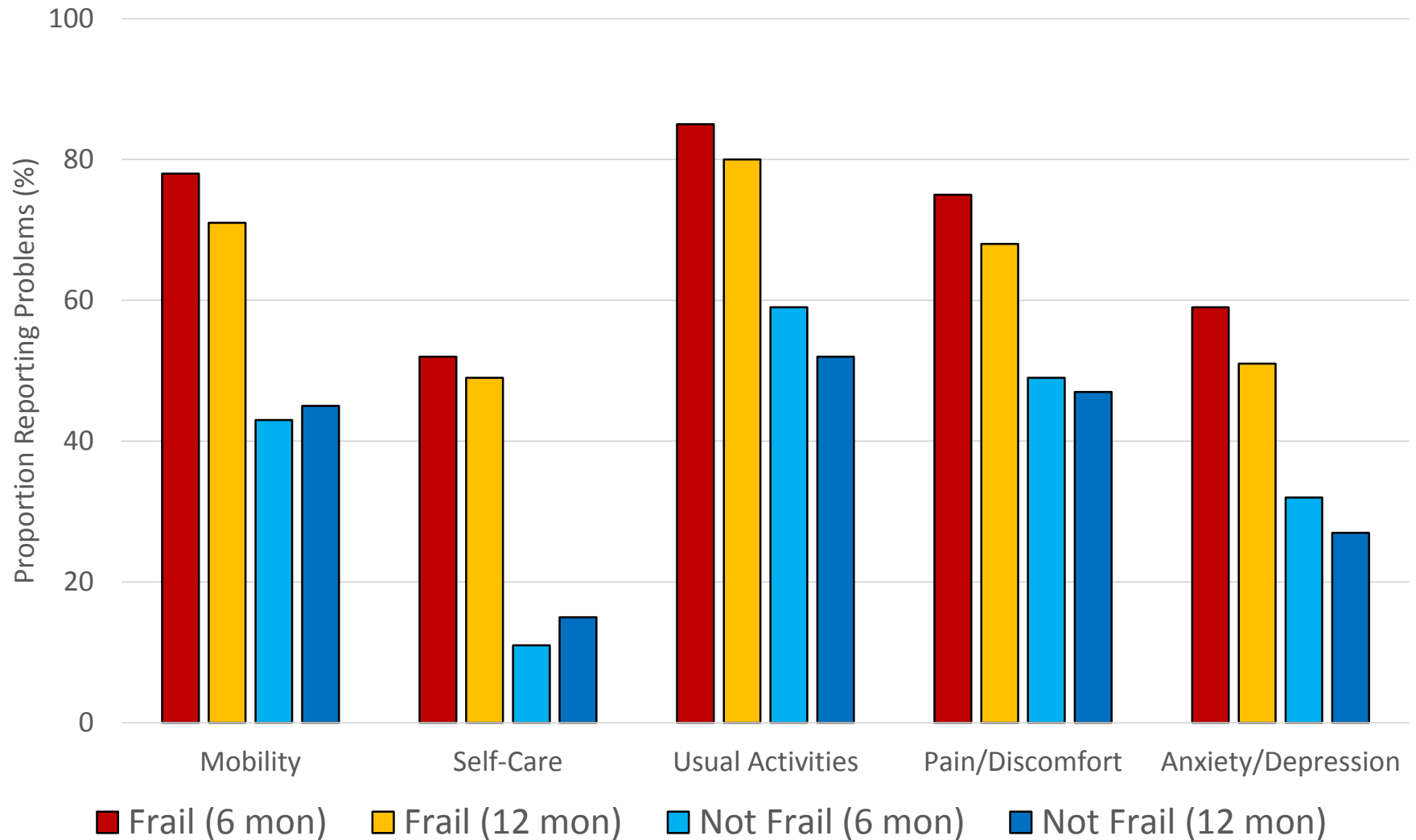
$p < 0.001$, for each

EQ-VAS by CFS Score



$p < 0.001$ each, for between CFS score analysis

EQ-5D Domains (Problems) Stratified by Frailty



p<0.001 each

Frailty Prevalence by Age



	Age Strata (years)		
Frail (N, %)	50-64	65-74	≥ 75
YES	55 (27.9)	41 (32.5)	42 (42.9)
NO	142 (72.1)	85 (67.5)	56 (57.1)

Knowledge Implications



- 1. Better informed triage decisions ~**
 - Regarding to suitability for ICU admission

- 2. Better informed ICU decision-making ~**
 - Regarding scope of support (i.e., time-limited trials)
 - Regarding over-arching goals of care
 - Survivorship expectations (i.e., impact on HRQL, new disability, institutionalization, rehospitalization)

Knowledge Implications



3. Transitions of care ~

- Priorities/specialized needs for ICU to ward
- Priorities/specialized needs for hospital to community (i.e., CGA)

4. Interventions (recognizing vulnerability)~

- Focused on maximizing physical recovery (i.e., minimizing disability)
- Focused on cognitive, psycho-social, and emotional recovery
- Focused on care-giver burden/experience

FRAILITY as a Therapeutic Target



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Geriatric interventions	ICU-specific equivalent
Cognitive Stimulation	Early awakening from sedation Delirium prevention Cognitive stimulation!
Exercise training	Early mobilization Early (targeted) rehabilitation
Nutritional supplementation	Nutritional supplementation
Pharmacological agents	Minimize unnecessary drugs? Testosterone? Stimulants?
Multi-modal interventions	Multi-modal intervention (ICU culture)
Home-based interventions	Transitions of care (ICU to ward) CGA prior to hospital discharge

eCritical CFS Implementation



- **Objective:** Multi-phased pilot project to evaluate the feasibility of implementing the **Clinical Frailty Scale** as part of the routine admission documentation into a province ICU EMR (eCritical) for patients admitted to ICUs across Alberta
- **Investigators:** Sean Bagshaw, Tom Stelfox, David Zygun, Dan Zuege, Darryl Rolfson, Darren Hudson, Olajide Olabode, Amal Hammami, Dawn Opgenorth

ICU EMR: eCritical/TRACER



- **eCritical:**

- is the common CIS platform being deployed in all pediatric, adult and cardiac ICUs across Alberta.
- eCritical is a bedside system (MetaVision™), which provides for full electronic inter-disciplinary clinical documentation and collation of demographic, diagnostic/case-mix, lab and device data (i.e., ventilator)

- **TRACER:**

- is a data warehouse and clinical analytics system.
- provides a comprehensive, multi-modal and integrated data repository of patient-specific critical care clinical information
- enables data extracts to support administrative, quality improvement, educational and research purposes, in addition to informing strategic planning of the health system.

eCritical (MD Admission Form)

Physician Admission Form

Acute

Acute Digestive Process Present on ICU Admission None Choose "All Other" for acute disease processes within the organ system but not included in the list

Acute Hepatic Process Present on ICU Admission Liver Failure Choose "None" if no reason acute disease process related to that organ system is present

Acute Neurologic Process Present on ICU Admission Coma, Stupor, Obtunded Pa


Chronic Health Conditions

Select Yes or No for each of following chronic health conditions

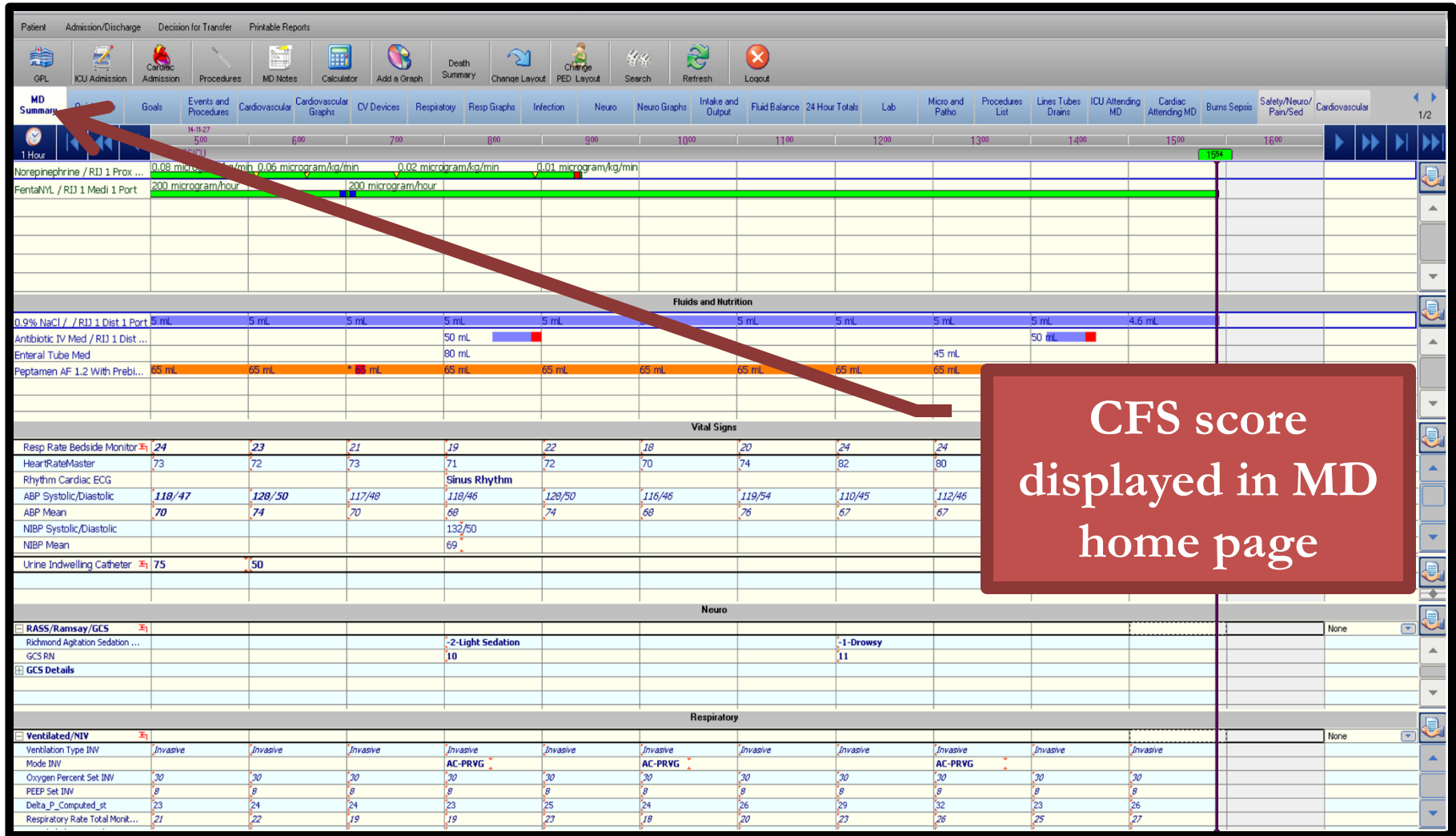
<u>AIDS</u>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<u>Diabetes Mellitus Requiring Medication</u>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<u>Chronic Dialysis</u>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<u>Hepatic Failure</u>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<u>Chronic Heart Failure</u>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<u>Immune Suppression</u>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<u>Chronic Respiratory Insufficiency</u>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<u>Leukemia</u>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<u>Cirrhosis</u>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<u>Lymphoma</u>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
			<u>Metastatic Cancer</u>	<input type="checkbox"/> Yes	<input type="checkbox"/> No

MD/CHS IV Diagnosis

Save and Close Save Cancel



eCritical (MD Summary Page)



eCritical (RN + AH Charting)

15-9-26
6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00
UAH-GSICU/BURN

Alerts	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	Units	
InsulinOn_NoGlucose_st	WARNING: H	WARNING: H	WARNING: H	WARNING: H	WARNING: H	WARNING: H	WARNING: H				WARNING: H	WARNING: H	WARNING: H	None
Labs														
Glucometer Reading	5.6													
Glucose Blood Gas			7.9					12.4						
TEMPERATURE														
Axillary Temperature	37.5													
CARDIOVASCULAR														
Heart Rate	64	64	71	71	77	66	77	66	68					
Insulin Regular / LUA 1	2 unit/hour					1 unit/hour		2 unit/hour						

Vital Signs Plus, Vital Signs for Titration, Chest Pain Assessment, Pain, Neuromuscular Blockade, EVD Open/Close Intervention, EVD Open/Close/Output Graph View, Glucometer Reading, ACT Result, Restraint Check, Repos, Assessment, Assessment View, Events view, Fluid Boluses, Analgesic / Sedative Infusions (Wt), Analgesic / Sedative Infusions (Non Wt), Cardiovascular Infusions (Wt), Cardiovascular Infusions (Non Wt), Anticoagulants Plus (Wt), Anticoagulants Plus (Non Wt), Neuromuscular Blocking, Miscellaneous Infusions (Wt), Miscellaneous Infusions (Non Wt), Blood Products, PRN/Crisis Medications, Analgesic / Sedative, Cardiovascular

CFS score displayed to RN + AH ~ are able to chart clinical data relevant to frailty

CFS Implementation Phases



1. Stakeholder Engagement

- Education, focus groups, survey

2. Custom Configure eCritical

- CFS entry into admission forms, CFS display across providers

3. Pilot Implementation (“Go Live”)

4. Evaluation/scaling

- Inter-professional feedback, audit eCritical CFS scores, reliability/validity testing

CFS Implementation ~ Value Added



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1. Providing a validated measure to systematically identify vulnerable and frail patients admitted to Alberta ICUs
2. Providing a mechanism to translate of frailty-specific information between care providers and across a spectrum of care settings
3. Providing a mechanism to design, evaluate and implement further interventions specifically targeting frail patients
4. Providing a clear methodology on how to scale our model to other health jurisdictions across Canada
5. Providing a platform to develop quality indicators, to reduce practice variation, and inform policy

Next Steps ~ Vision



1. **Develop a risk identification tool** aimed to trigger consultations with geriatric medicine among “high-risk” ICU survivors
2. **Develop a clinical decision support (CDS) tool** for frail patients targeting actions related to structured daily goals, customized needs for rehabilitation and goals of care - with the aim of returning patients to their pre-morbid or acceptable level of function
3. **Develop mechanisms to target dissemination**, detailing the spectrum needs (i.e., educational, operational, infrastructure), to ICUs characterized by higher burdens of frail admissions
4. **Inform policy and practice** (i.e., develop a tiered “frail” care pathway) - that aims to not only support patients but also their families during transitioning care across the spectrum

Conclusions



- **Frailty** is a multi-dimensional syndrome contributing to vulnerability to adverse events
 - can be measured in critically ill patients
 - is associated with ↑ risk adverse events, death, re-hospitalization, ↓ HRQL, new disability
- **Frailty Assessment** ~ identifies a vulnerable population, and may improve prognostication, guide clinical care, and resource utilization
- **Frailty as a therapeutic target** ~ is less well defined
- **Implementation Proposal** ~ first systematically measure the scope of the problem



You never see it coming (frailty)

Thank You For Your Attention



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Acknowledgements:

Investigators: Tom Stelfox, Rob McDermid, Sumit Majumdar, Darryl Rolfson, Daniel Stollery, Ella Rokosh, Ross Tsuyuki, Quazi Ibrahim, Dan Zuege, David Zygun, Darren Hudson

Research Team: Tracy Davyduke, Maliha Muneer, Nadia Baig, Barbara Artiuch, Kristen Reid, Gwen Thompson, Robin Scheelar, Jennifer Barchard, Dawn Opgenorth, Olajide Olabode, Amal Hammani

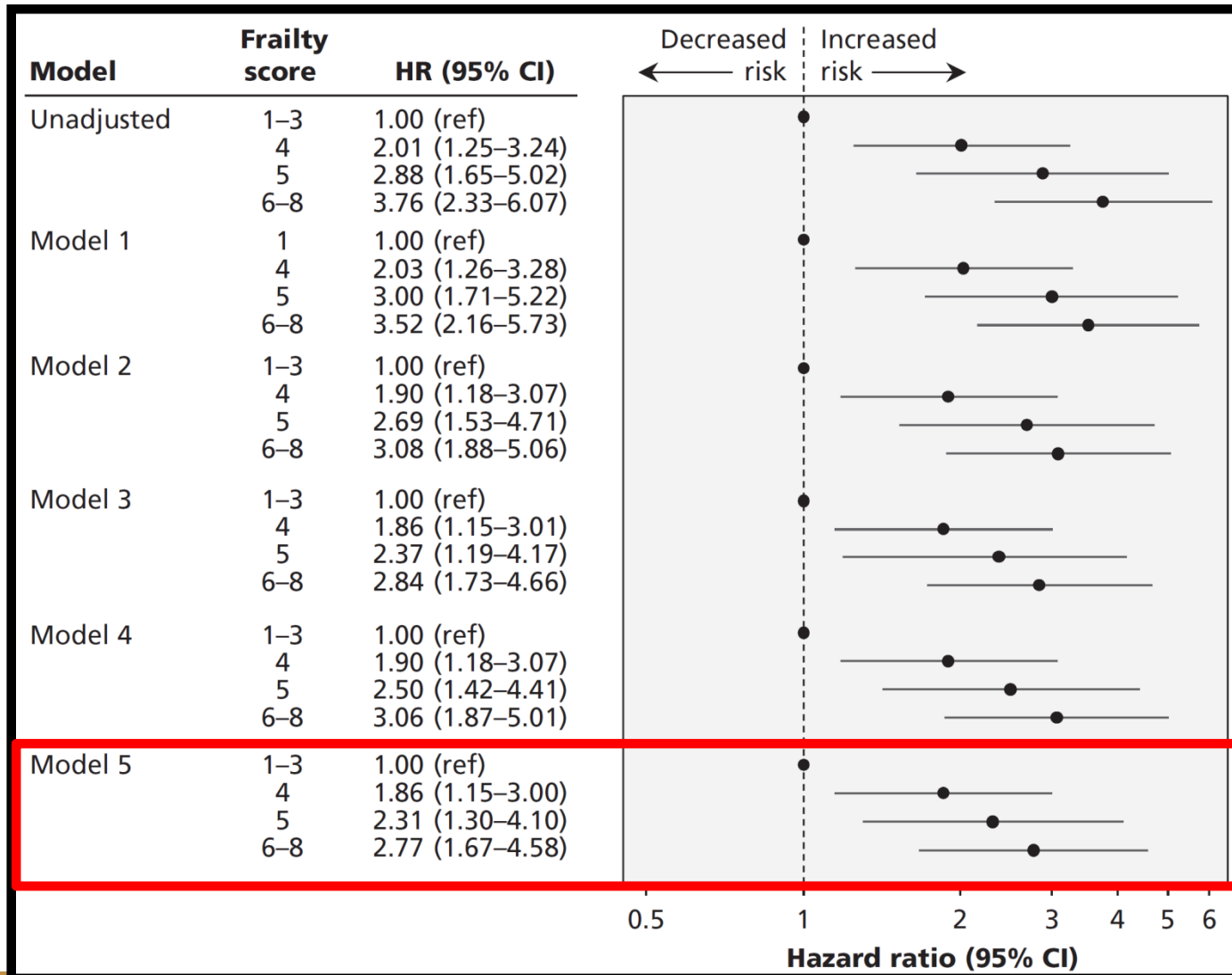


Questions?

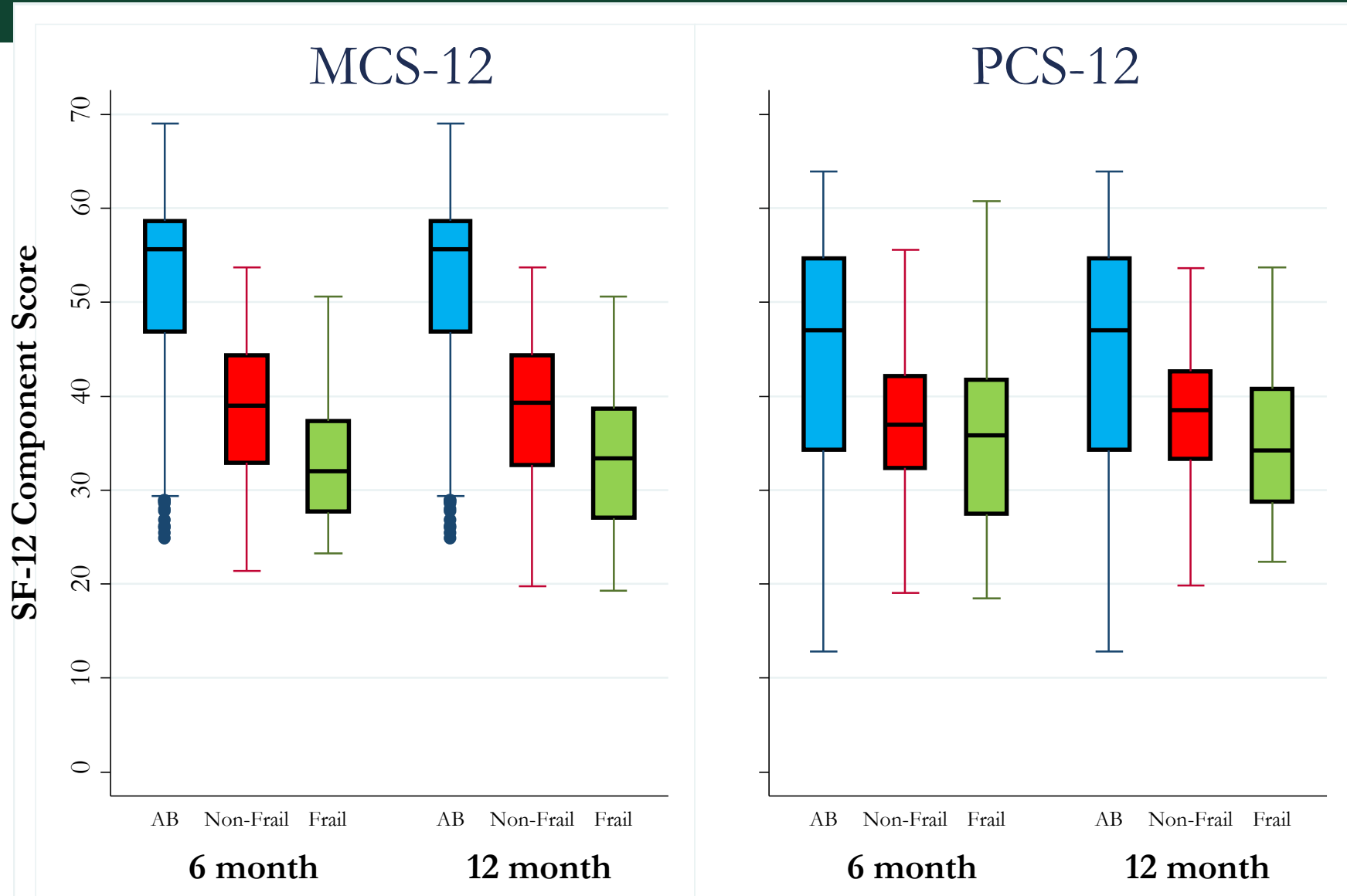
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Adjusted Hazard Ratios for Death within 12 months after ICU



SF-12 Component Score



$p < 0.001$ for each, except PSC at 6 months

Comparative HRQL (EQ-5D)	Author	N	EQ-VAS (95% CI)	EQ-Index (95% CI)
Population (Alberta)	Johnson	1,484	78.8 (78.0-79.6)	0.84 (0.83-0.85)
Chronic Disease-related				
Stroke	Pickard	124	70.0 (66.3-73.4)	0.62 (0.55-0.69)
Diabetes Mellitus (Type 2)	Grandy	1,741	67.6 (19.6) [¶]	0.77 (0.19) [¶]
Heart failure	Spertus	476	62.0 (20.0) [¶]	0.67 (0.26) [¶]
ESKD	Manns	192	61.3 (58.7-64.0)	0.61 (0.57-0.65)
Critical Illness-related				
MV treated ARDS	Granja	29	73	0.82
General critical illness	Badia	334	70 (50-90) [§]	-
Sepsis	Orweilius	91	70 (50-80) [§]	0.68 (0.50-0.91) [§]
RRT treated AKI	Vaara	274	70 (50-80) [§]	0.63 (0.49-0.79) [§]
ICU Survivors (Not Frail)	Bagshaw	195	64.6 (61.9-67.3)	0.80 (0.78-0.83)
Frail (ICU survivors)	Bagshaw	68	52.2 (47.0-57.4)	0.57 (0.51-0.63)