SGAIM SSMIG SSGIM

Schweizerische Gesellschaft für Allgemeine Innere Medizin
Société Suisse de Médecine Interne Générale
Società Svizzera di Medicina Interna Generale
Swiss Society of General Internal Medicine

Top-5 Recommendations
"SMARTER MEDICINE IN THE HOSPITAL"

Prof. Christoph A. Meier et al.
Annual Congress SSMIG
Basel, May 25th 2016

"Smarter Medicine in the Hospital" Goals of our project

▪ Generate a list of **5 low value interventions commonly performed in Swiss general internal hospital medicine units** which, according to the available evidence, may not provide any meaningful benefit and may carry the risk of generating harms.

▪ Publish & distribute this list to Swiss physicians to discourage the use of these interventions.

▪ Implement "Smarter Medicine in the Hospital" in medical education and practice to contribute to the efforts of fostering better patient quality of care.

"Smarter Medicine in the Hospital"
Our Working Group – led by Prof. C. A. Meier

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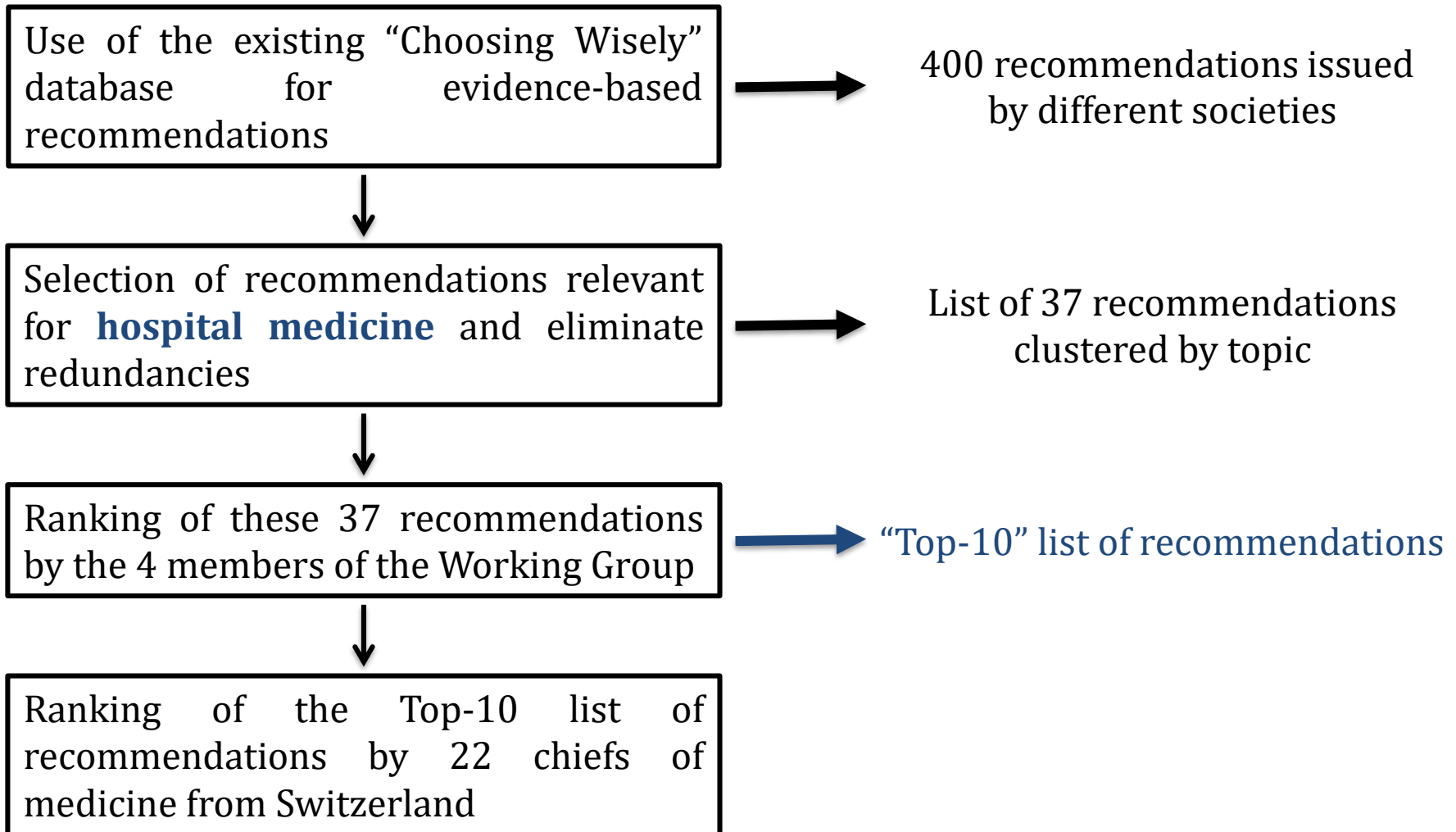Ospedale Regionale
di Bellinzona e Valli

Top-5 selection process

The selection process was inherently arbitrary with regard to which recommendations are considered 'important'.

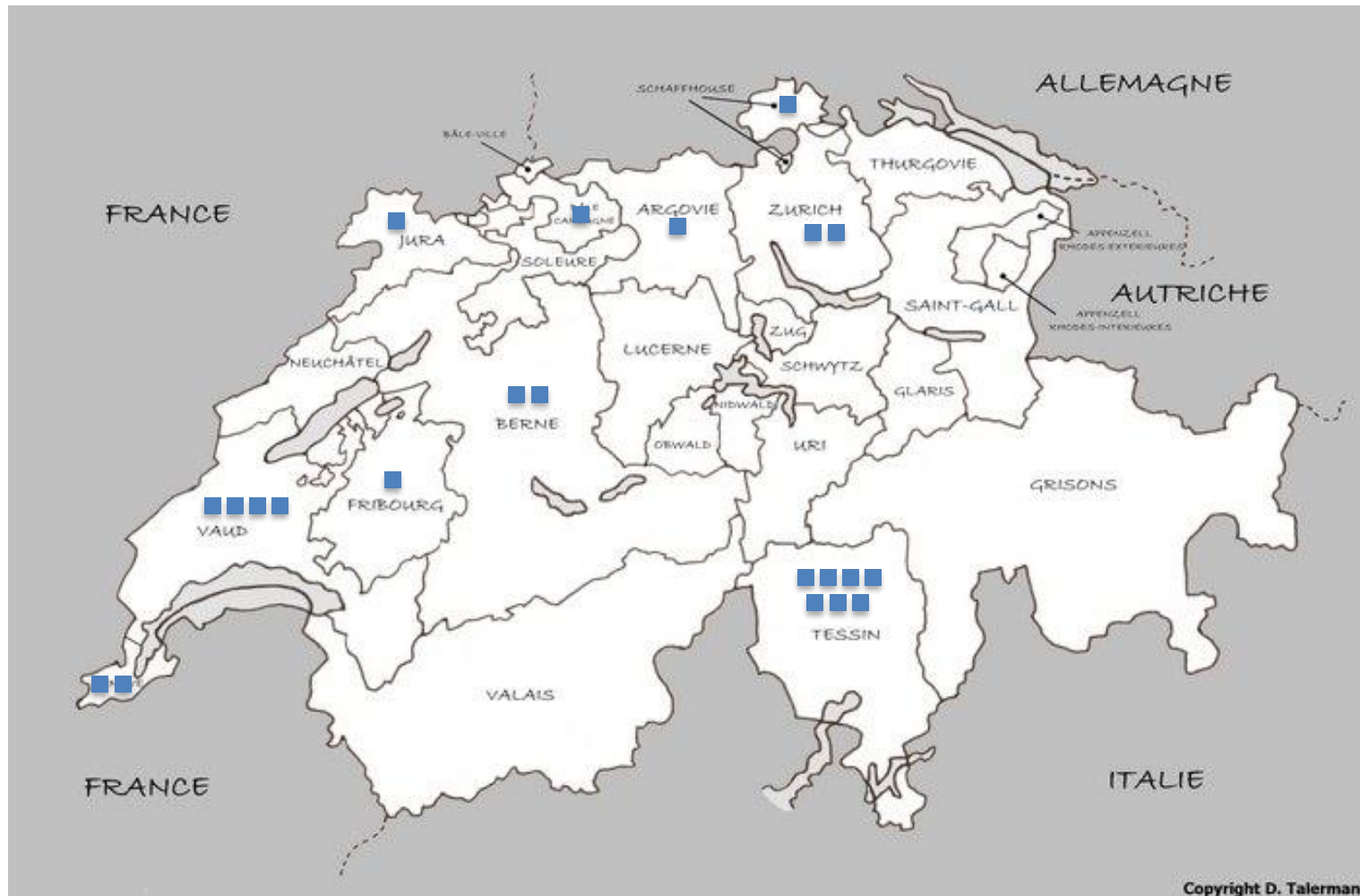**How do we select relevant interventions that will have the greatest impact?**

The selection process had to take into account the practices and challenges in the Swiss health care system and was based on:

- Evidence level

- Frequency

- Cost savings

- Risks & benefits for patients
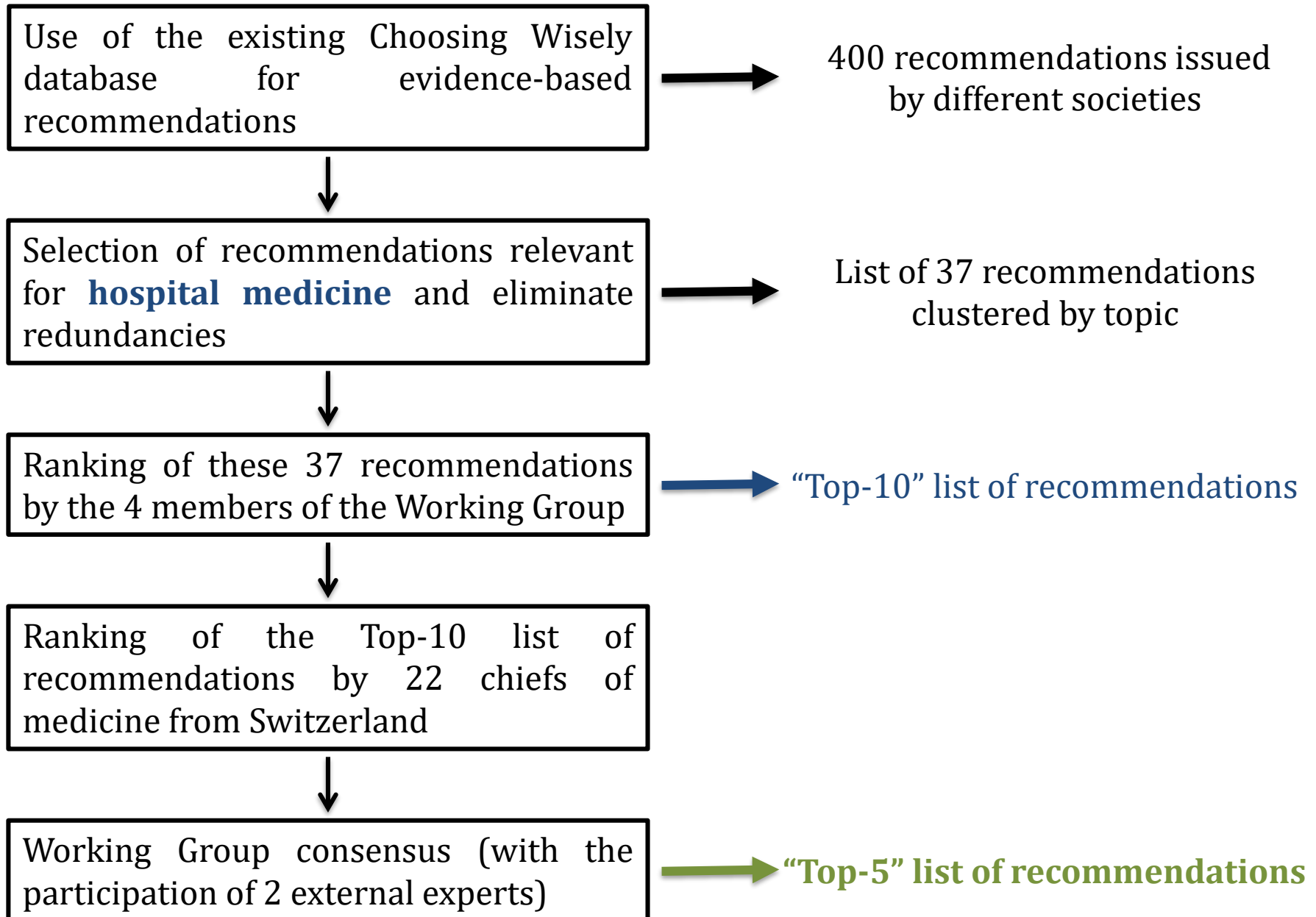
Top-5 selection process

Use of the existing "Choosing Wisely" database for evidence-based recommendations → 400 recommendations issued by different societies

Selection of recommendations relevant for **hospital medicine** and eliminate redundancies → List of 37 recommendations clustered by topic

Ranking of these 37 recommendations by the 4 members of the Working Group → "Top-10" list of recommendations

Ranking of the Top-10 list of recommendations by 22 chiefs of medicine from Switzerland

Good representativity of the Swiss medical practice

Copyright D. Talerman

■ = participant

Top-5 selection process

Use of the existing Choosing Wisely database for evidence-based recommendations	→ 400 recommendations issued by different societies
Selection of recommendations relevant for **hospital medicine** and eliminate redundancies	→ List of 37 recommendations clustered by topic
Ranking of these 37 recommendations by the 4 members of the Working Group	→ "Top-10" list of recommendations
Ranking of the Top-10 list of recommendations by 22 chiefs of medicine from Switzerland	
Working Group consensus (with the participation of 2 external experts)	→ **"Top-5" list of recommendations**

"Smarter Medicine in the Hospital" Recommendation #1

Don't order blood tests at regular intervals (such as every day) or routine extensive lab panels including X-rays without specific clinical questions.

Many diagnostic studies are ordered at regular intervals (e.g. daily). Compared with a practice of ordering tests only to help answer clinical questions, the routine ordering of tests increases health care costs, does not benefit patients and may in fact harm them. Potential harms include anemia due to unnecessary phlebotomy, which may necessitate risky and costly transfusion, and the aggressive work-up of incidental and non-pathological results found on routine studies.

Sources : the American Association of Critical-Care Nurses, the American College of Chest Physicians, the American Thoracic Society and the Society of Critical Care Medicine & CH expert panel

Evidence level : Before-After studies, Randomized Controlled Trials, Meta-analysis

Rationale – recommendation #1

Unnecessary blood draws may cause harm by contributing to:

- Psychological pain and discomfort for the patient

- Increase the risk of generating false positive results

Red herrings leading to further unnecessary procedures and treatments

- The Dracula syndrome

Excessive phlebotomy decreases patients' hemoglobin levels and can result in hospital-acquired anemia which has been associated with increased length of stay, need for blood transfusions, and increased mortality.

Preventing
Duplicate
Laboratory Testing

- Financial cost

Alonso-Cerezo MC et al., Clin Chem Lab Med, 2009
Detsky AS and Krumholz HM, JAMA, 2014

Why do we order unnecessary lab tests ?

- Lack of physician training

- Provider convenience

- Ease of access

- Habit/Defensive practice

- Development and availability of new tests

- Awareness and utilization of clear decision rules are lacking

- Demand from patients themselves

Alonso-Cerezo MC et al., Clin Chem Lab Med, 2009

Eliminate unnecessary tests and procedures How to do it?

- Active educational intervention (eg. interactive didactic presentations, discussions, educational flyers, weekly email communications)

Thakkar RN et al., Am J Clin Pathol 2015

Eliminate unnecessary tests and procedures How to do it?

- Active educational intervention (eg. interactive didactic presentations, discussions, educational flyers, weekly email communications)

- Computer-based order entry system with reminders of appropriate indications to help for decision support

Sy E et al., BMJ Qual Saf 2015

Eliminate unnecessary tests and procedures How to do it?

- Active educational intervention (eg. interactive didactic presentations, discussions, educational flyers, weekly email communications)

- Computer-based order entry system with reminders of appropriate indications to help for decision support

- Development of guidelines for appropriateness of laboratory test orderings

- Regular audit and feedback of performance data

One intervention which could help reducing unnecessary laboratory tests and phlebotomies

May TA et al., Reducing Unnecessary Inpatient Laboratory
Testing in a Teaching Hospital, Am J Clin Pathol 2006

Aim: Minimize unnecessary phlebotomies and laboratory tests **by reconfiguring the electronic order function** to limit phlebotomy-laboratory test requests to occur singly or to recur within one 24-hour window

- **12% fewer inpatient tests**, of which 57.5% were related directly to decreases in the 5 most frequently ordered tests.

- **Reduction of phlebotomies by 20%.**

- Cost savings & new labor capacity

Roadmap for the development of high-value care, cost-conscious practices

"Smarter Medicine in the Hospital" Recommendation #2

Don't place, or leave in place, urinary catheters for incontinence, convenience or monitoring of output for non-critically ill patients.

Catheter Associated Urinary Tract Infections (CAUTIs) are the most frequently occurring health care acquired infection (HAI). Use of urinary catheters for incontinence or convenience without proper indication or specified optimal duration of use increases the likelihood of infection and is commonly associated with greater morbidity, mortality and health care costs. Published guidelines suggest that hospitals and long-term care facilities should develop, maintain and promulgate policies and procedures for recommended catheter insertion indications, insertion and maintenance techniques, discontinuation strategies and replacement indications.

Sources: The Society of Hospital Medicine & CH expert panel

Evidence level: IDSA Guidelines, Randomized Controlled Trials, Before-After and Prospective studies, Meta-analysis

Rationale – recommendation #2

- Urinary catheters are often placed without proper indication and physician awareness and are not removed when no longer necessary[1].

- The duration of catheterization is the most important risk factor for the development of catheter-associated urinary tract infection (CAUTI)[2].

- CAUTI is the most frequent health care-associated infection worldwide (up to 40% in US hospitals each year)[2,3].

1. Saint S. et al., The American Journal of Medicine, 2000
2. Foxman B., The American Journal of Medicine, 2002
3. National Nosocomial Infections Surveillance (NNIS) System Report, Am J Infect Control 2004

CAUTIs are frequent, costly and often preventable putting an unnecessary burden on patients and health care systems.

How to do it?

Prevention of CAUTIs

Catheter Placement

1

Catheter Care

2

Catheter Removal

3

Catheter Re-insertion

4

Meddings J et al., BMJ Qual Saf 2014
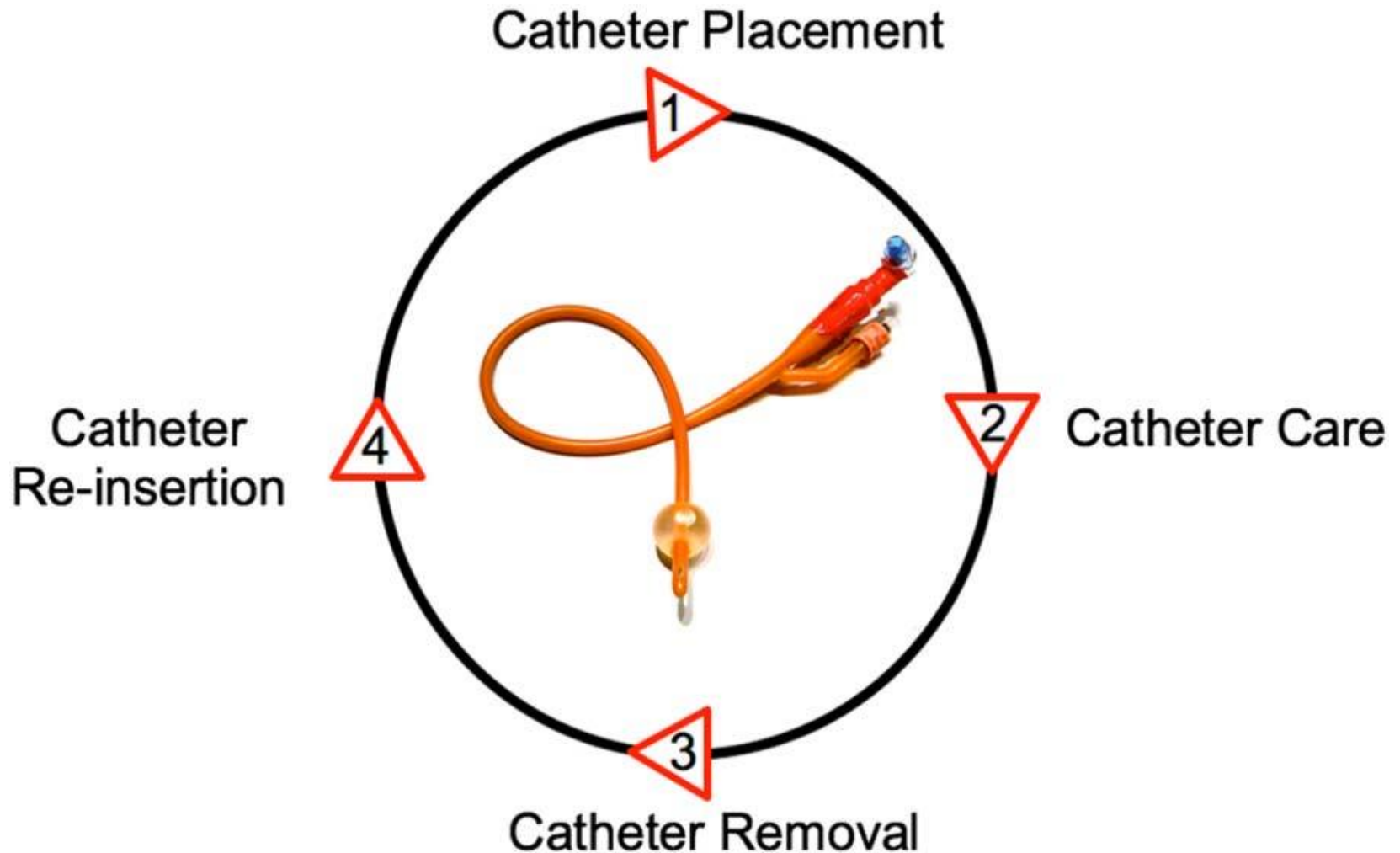
Prevention of CAUTIs –
Disrupting the urinary catheter lifecycle

Prevent Unnecessary and Improper Placement

(eg. education, catheter placement restrictions and urinary retention protocols

Prevent Catheter Replacement

(surveillance and feedback)
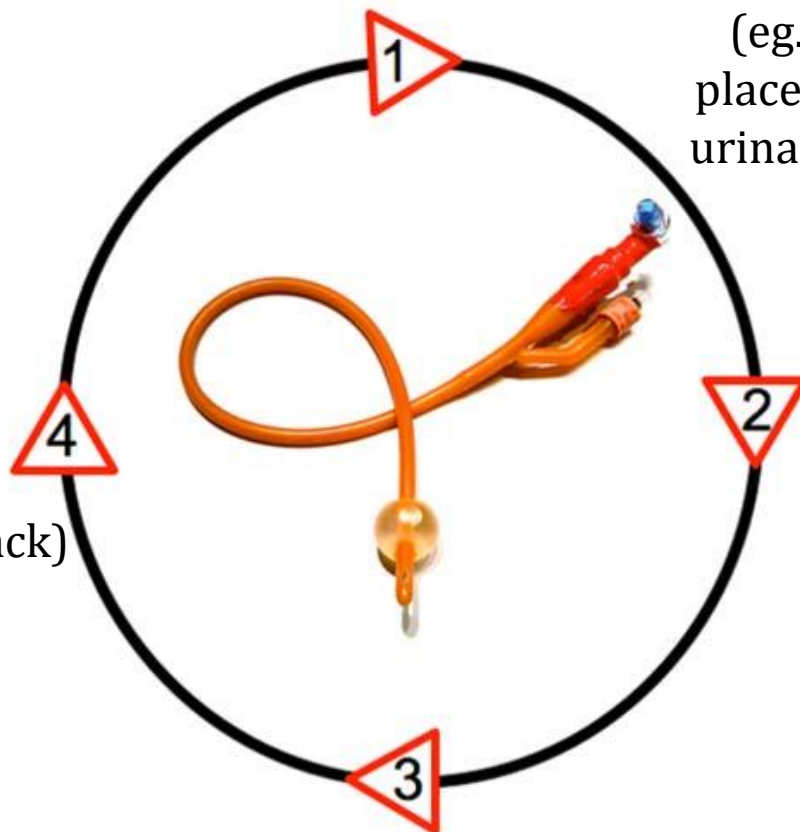
Maintain Awareness and Proper Care of Catheters in Place

(eg. education regarding UC maintenance or Bladder bundle of interventions)

Prompt Catheter Removal when no longer needed

(eg. daily checklist/reminders or stop orders)

Meddings J et al., BMJ Qual Saf 2014

Early Catheter Removal: Summary of the Evidence

Meddings J et al., Systematic Review and Meta-Analysis: Reminder Systems to Reduce Catheter-Associated Urinary Tract Infections and Urinary Catheter Use in Hospitalized Patients, Clinical Infectious Diseases, 2010

14 studies (2 RCTs, 12 Pre-post studies)

- Significant **reduction in catheter use** and **CAUTI rate by 52%**

- The mean duration of catheterization decreased by 37%

- No evidence of harm (ie. re-insertion)

Direct medical cost savings : Each episode of CAUTI is estimated to cost at least $600, and bacteremia associated with CA-bacteriuria ~ $3000.

Saint S, Am J Infect Control, 2000
Tambyah PA et al., Infect Control Hosp Epidemiol, 2002

"Smarter Medicine in the Hospital" Recommendation #3

Don't transfuse more than the minimum number of red blood cell (RBC) units necessary to relieve symptoms of anemia or to return a patient to a safe haemoglobin range (7 g/dL in stable non-cardiac patients and 8 g/dL in stable patients with pre-existing cardiovascular disease).

Transfusion of the smallest effective dose of RBCs is recommended because liberal transfusion strategies do not improve outcomes when compared to restrictive strategies. Unnecessary transfusion generates costs and exposes patients to potential adverse effects without any likelihood of benefit. Clinicians are urged to avoid the routine administration of 2 units of RBCs if 1 unit is sufficient.

<u>Sources</u>: The American Society of Hematology & CH expert panel

<u>Evidence level</u>: Randomized Controlled Trials, Guidelines, Meta-analysis

Rationale – recommendation #3

■   Anemia is highly prevalent in critically ill patients and is associated with adverse outcomes (eg. death, organ failure progression, infection or prolonged hospital stay), especially amongst those with cardiovascular disease[1].

■   Currently, there is no clinically or cost-effective alternative to RBC transfusion for rapidly increasing the hemoglobin level and restoring O_2 carrying capacity[2].

■   Transfusion of RBC is associated with a risk of adverse events, is expensive ($200-300 per unit), and is a limited resource[3].

1. Marik PE & Corwin HL, Critical Care Medicine, 2008
2. Retter A et al., British Journal of Haematology, 2013
3. Toner RW et al., Appl Health Econ Health Policy, 2011

30-Day Overall Survival is Not Reduced with Restrictive Transfusion in ICU Patients

Hébert PC et al., A multicenter, randomized, controlled clinical trial of transfusion requirements in critical care, N Engl J Med 1999

TRICC Study			
838 euvolemic ICU patients with Hb<9g/dL			
	Restrictive Transfusion (Trigger <**7**g/dL)	Liberal Transfusion (Trigger <**10**g/dL)	P-value
# of Patients	418	420	
30 day Mortality	18.7%	23.3%	NS
60 day Mortality	22.7%	26.5%	NS
Hospital Mortality	22.2%	28.1%	p = 0.05

25 centers, Nov 1994 - Nov 1997   **43% of patients with cardiovascular diseases**

Mortality is Not Increased with Restrictive Transfusion in Hip-Fracture Patients

Carson JL et al., Liberal or Restrictive Transfusion in
High-Risk Patients after Hip Surgery, N Engl J Med 2011

FOCUS Study			
2016 patients with either a history of or risk factors for cardiovascular diseases			
	Restrictive Transfusion (Trigger <**8**g/dL)	Liberal Transfusion (Trigger <**10**g/dL)	P-value
# of Patients	1009	1007	
30 day Mortality	4.3%	5.2%	NS
60 day Mortality	6.6%	7.6%	NS
Hospital Mortality	1.4%	2.0%	NS

47 centers, July 2004 – Feb 2009

Blood management by transfusion triggers:
"When less is more"

Evidence from **a 2014 meta-analysis including 19 studies**
(6264 patients)

Overall mortality is not adversely affected and use of fewer RBC transfusions reduces cost and risks for adverse effects of transfusion.

1) Restrictive strategies reduced the risk of receiving a RBC transfusion by 39%.

1) The volume of RBCs transfused was reduced by 1.19 units.

1) Restrictive transfusion decreases the rate of adverse events compared to liberal transfusion.

1) Restrictive transfusion strategies is often associated with a significant reduction in hospital mortality.

Carson JL et al., Transfusion thresholds and other strategies for guiding allogeneic red blood cell transfusion, Cochrane Database Syst Rev. 2014

Transfusion Triggers: Summary of the Evidence

The recommended hemoglobin triggers are based on results from individual trials in which this concentration was used in the restrictive group[4]:

- 7 g/dL in adult and pediatric intensive care unit patients (TRICC[5] - Transfusion Requirements in Critical Care and TRIPICU[6] - Transfusion Strategies for Patients in Pediatric Intensive Care Units trials).

- 8 g/dL in patients at high risk of coronary events (FOCUS[7] – Functional Outcomes in Cardiovascular Patients Undergoing Surgical Hip Fracture Repair).

4. Carson JL et al., Annals of Internal Medicine, 2012
5. Hébert PC et al., N Engl J Med, 1999
6. Lacroix J et al., N Engl J Med, 2007
7. Carson JL et al., N Engl J Med, 2011

"Smarter Medicine in the Hospital" Recommendation #4

Don't let older adults lie in bed during their hospital stay. In addition, individual therapeutic goals should be established considering the patients' values and preferences.

Up to 65% of older adults who are independent in their ability to walk will lose their ability during a hospital stay. Walking during the hospital stay is critical for maintaining functional ability in older adults. Loss of walking independence increases the length of hospital stay, the need for rehabilitation services, new nursing home placement, risk for falls both during and after discharge from the hospital and increases the risk of death for older adults. Bed rest or limited walking (only sitting up in a chair) during a hospital stay causes deconditioning and is one of the primary factors for loss of walking independence in hospitalized older adults.

Sources: The American Academy of Nursing & CH expert panel

Evidence level: Before-After and Prospective studies, Expert Consensus

Rationale – recommendation #4

■ Older adults (over 65 years) account for 60% of all hospital admissions and experience consequential adverse outcomes directly related to hospitalization (eg. falls, delirium and **functional decline**)[1,2].

■ Older hospitalized patients spend most of their time lying in bed, despite an ability to walk independently. **43 min** is the median time a hospitalized elderly patient spends standing or walking daily[3].

■ New walking dependence affect up to 60% of hospitalized older patients and may occur after as fast as 2 days of bed rest[4,5].

■ The cost for additional medical and long term care support for newly disabled older adults in the United States is estimated at $26 billion/year[6].

1 Creditor MC, Annals of Internal Medicine, 1993
2 Zisberg A et al., Journal of the American Geriatrics Society, 2011
3 Brown CJ et al., Journal of the American Geriatric Society, 2009
4 Hirsch C et al., Journal of the American Geriatric Society, 1990
5 Mahoney J, Clinics in Geriatric Medicine, 1998
6 American Academy of Nursing (Choosing Wisely campaign)

Impact of loss of independent ambulation on the elderly hospitalized patients

- Caregiver burden and higher resource use

- Increased length of hospital stay

- Falls during and after hospitalization

- Nursing home admissions

- Mortality

Brown CJ et al., Journal of the American Geriatrics Society, 2004
Inouye SK et al., Journal of the American Geriatrics Society, 2000

Deconditioning effects of bed rest is one of the most predictable cause for newly acquired ambulation deficits in older patients

- After 10 days of bed rest, healthy older adults lose 2.2 pounds of muscle mass from their legs[7] with 2-5%/day loss of muscle strength[8].

- Bed rest promoted overall declines in muscle mass, muscle strength, and physical function in older individuals[7,9].

7 Kortebein P et al., J Gerontol A Biol Sci Med Sci, 2008
8 Gillis A and MacDonald B, Canadian Nurse, 2005
9 Coker RH et al., J Gerontol A Biol Med Sci, 2015

Effect of **10 days of bed rest** on changes in regional body composition, muscle strength, and functional status in older individuals

19 older participants (aged between 60 and 85 years)

	Total Group - Pre	**Total Group - Post**
1 RM knee extension (N)	85.9 ± 8.0	75.2 ± 6.6*
Isometric knee extension (N)	133.6 ± 10.1	122.5 ± 8.9*
Concentric knee extension (60°; Nm/s)	115.4 ± 10.4	102.7 ± 7.8*
Stair ascent time (s)	4.37 ± 0.24	5.29 ± 0.38*
Stair ascent power (Nm/s)	302.1 ± 19.5	264.8 ± 17.4*
Stair descent time (s)	4.00 ± 0.24	4.94 ± 0.41*
Stair descent power (Nm/s)	302.1 ± 19.5	292.1 ± 27.8*
Maximal VO2 peak (l/min)	21.5 ± 1.3	18.6 ± 1.0*
Five-minute walk (m)	438.1 ± 19.1	405.5 ± 19.6*
Walking speed (m/s)	1.46 ± 0.06	1.35 ± 0.06*
Chair stand (s)	8.41 ± 0.58	9.43 ± 0.57*

RM = repetition maximum. Values are mean ± SEM. *Denotes significant difference between pre- and post-bed rest values ($p < .05$).

Strategies to maintain and improve functioning in elderly patients

- Promote Ambulation
(low beds without rails, carpeting, encouragement and assistance, minimization of "tethers")

- Reality orientation
(clocks, calendars, dressing and undressing, communal dining)

- Increased sensory stimulation
(proper lighting and decorating, newspapers and books)

- Functional change
(Primary care concept with nurses as central caregivers, resources, unit activity/expectations, sharing of objectives, family participation)

Creditor MC, Annals of Internal Medicine, 1993
Gillis A and MacDonald B, Canadian Nurse, 2005
Doherty-King B and Bowers B, The Gerontologist, 2011

Understanding the role of hospitalization in the progression of older patient disability is crucial in setting goals for improving patient care and systems of care to prevent loss of independence

Older adults who walk during their hospital stay

- are able to walk farther by discharge[10]

- are discharged from the hospital sooner[11]

- have improvement in their ability to independently perform basic activities of daily living (eg. bathing, dressing, toileting and eating)[12]

- have a faster recovery rate after surgery[13]

- are satisfied with being engaged in a walking program during their hospitalization stay[14]

10 Markey DW & Brown R J, Journal of Nursing Care Quality, 2002
11 Baird G et al., Clinical Nurse Specialist, 2010
12 Padula P et al., Journal of Nursing Care Quality, 2009
13 Pashikanti L and Von A D, Clinical Nurse Specialist, 2012
14 Tucker D et al., Geriatric Nursing, 2004

"Smarter Medicine in the Hospital" Recommendation #5

Don't use benzodiazepines or other sedative-hypnotics in older adults as first choice for insomnia, agitation or delirium and avoid prescription at discharge.

Large-scale studies consistently show that the risk of motor vehicle accidents, falls, and hip fractures leading to hospitalization and death can more than double in older adults taking benzodiazepines and other sedative-hypnotics. Older patients, their caregivers, and their providers should recognize these potential harms when considering treatment strategies for insomnia, agitation, or delirium. Use of benzodiazepines should be reserved for alcohol withdrawal symptoms/delirium tremens or severe generalized anxiety disorder unresponsive to other therapies.

Sources: The American Geriatrics Society & CH expert panel

Evidence level: Meta-analysis, Guidelines, Retrospective Cohort Studies, Randomized Controlled Trials

Rationale – recommendation #5

- Benzodiazepines (BZDs) are one of the most commonly prescribed drugs in the world. BZDs are often used on a long-term basis to treat in the elderly population various psychological disorders (eg. sleep disorders, neurological disorders, and anxiety)[1].

- Sedative-hypnotics are considered as one of the risk factors for fractures which lead, especially for the aging population, to increased mortality and severe disability[2].

- One-third of community-dwelling older adults experience a fall each year[3] due to multiple factors (eg. poor balance, effects of medication and polypharmacy, sleep problems, etc)[4].

- The cost of BZD-associated fall injuries has recently been estimated as €1.5–2.2 billion per year[5].

1 Xin D et al., Osteoporos Int, 2014
2 Allain H et al., Drugs Aging 2005
3 O'Loughlin JL et al., Am J Epidemiol 1993
4 Stone KL et al., Sleep Medicine 2008
5 Panneman MJ et al., Drugs Aging 2003

'Z'-compounds (i.e. zopiclone, zolpidem and zaleplon) as a safer alternative to BZDs?

Finkle WD et al., Risk of Fractures Requiring Hospitalization After an Initial
Prescription for Zolpidem, Alprazolam, Lorazepam, or Diazepam
in Older Adults, J Am Geriatr 2011

Zolpidem has a short half life (approximately 2 hours), preserves sleep architecture, and is well tolerated.
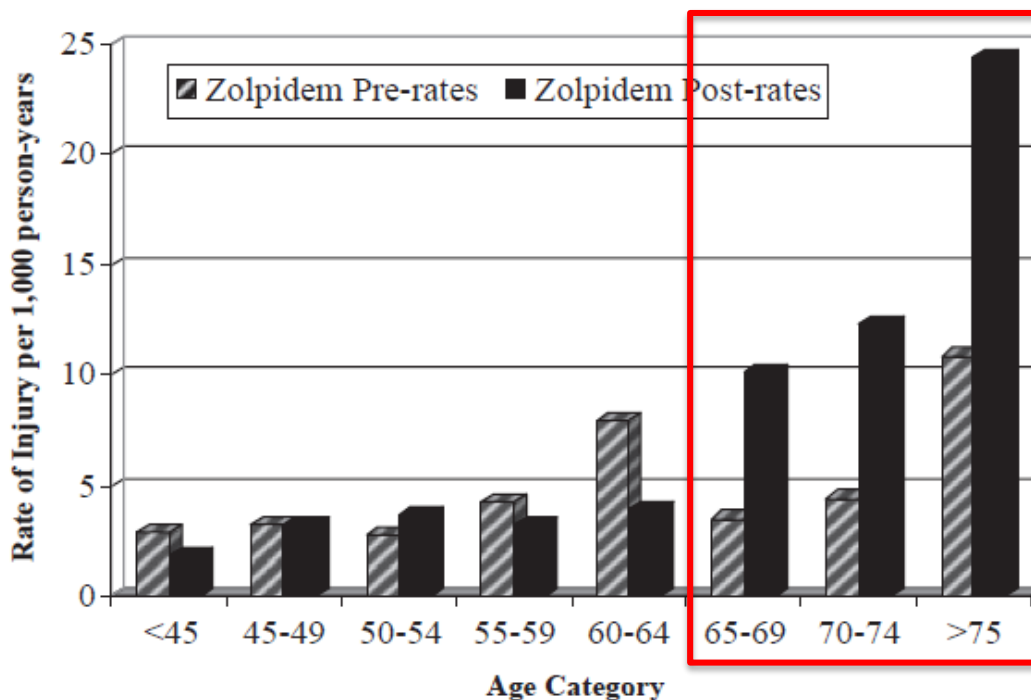
The Kaplan-Meier model showed that the cumulative hip fracture probability is significantly higher for zolpidem users.

Fang-Yu L et al., Retrospective Population Cohort Study on Hip Fracture Risk Associated with Zolpidem Medication, Sleep 2014

6,978 patients newly prescribed for zolpidem and 27,848 nonusers between 2000-2001

Zolpidem is unlikely to be a safer alternative to BZDs in older adults

Adapted from Finkle WD et al., Risk of Fractures Requiring Hospitalization After an Initial Prescription for Zolpidem, Alprazolam, Lorazepam, or Diazepam in Older Adults, J Am Geriatr 2011
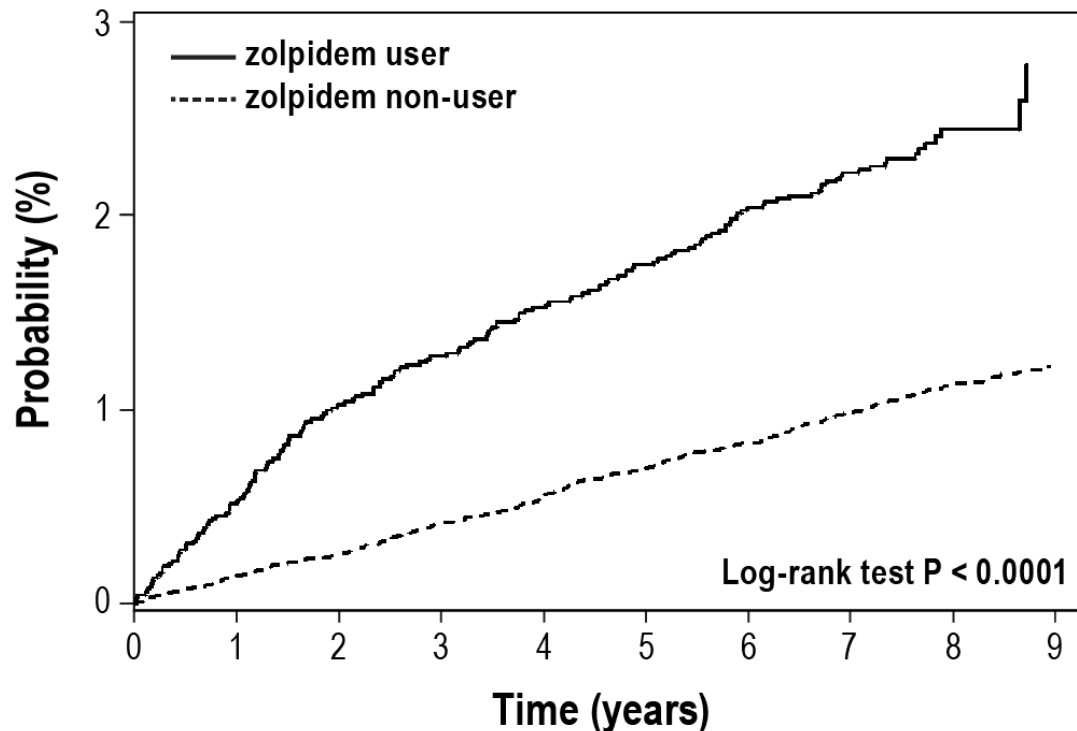
Fracture	Zolpidem	Alprazolam	Lorazepam	Diazepam
N	10,857	20,429	42,080	16,372
Adjusted N	-	14,939.9	29,793.8	10,150.0
Nonvertebral				
RR (95% CI)	2.55 (1.78-3.65)	1.14 (0.80-1.64)	1.53 (1.23-1.91)	1.97 (1.22-3.18)
P-value	<0.001	0.42	<0.001	0.01
Hip				
RR (95% CI)	3.11 (1.96-4.91)	1.46 (0.91-2.35)	2.05 (1.58-2.66)	2.03 (1.03-4.00)
P-value	<0.001	0.1	<0.001	0.04

Between Jan 1, 1999 and Sept 30, 2009 in Patients aged 65 and older

BZD use is associated with a moderate but clinically significant increase in the risk of fractures in the elderly population

Adapted from Xing D et al., Association between use of benzodiazepines and risk of fractures: a meta-analysis, Osteoporos Int 2014

Studies included	Relative risk		
	Number of studies	RR (95% CI)	P-value
All studies	25	1.25 (1.17-1.34)	< 0.001
Studies with participants aged ≥65 years	18	1.26 (1.15-1.38)	< 0.001
Studies that used hip fractures as outcome	17	1.35 (1.22-1.50)	< 0.001
Studies with methodological quality score ≥7	17	1.23 (1.15-1.31)	< 0.001

The relative fracture risk was increased by 26 % with participants aged ≥65 years.

25 studies (19 case–control and 6 cohort studies)

Clinical Implications and Conclusion

- Despite their potential to increase the risk of falls, fractures, and cognitive impairment in the elderly, the use of BDZs remains high (~9%)[6,7].

- Older adults have increased sensitivity to BZDs and decreased metabolism of long-acting agents[8].

- All BZDs increase the risk of falls, fractures, delirium, cognitive impairment, and motor vehicle crashes in older adults[8].

BZDs and the other sedative hypnotics are to be avoided without consideration of duration of use in the treatment of insomnia in the elderly because of their harms balanced with their minimal efficacy.

6 Davidoff AJ et al., J Am Geriatr Soc 2015
7 Olfson M et al., JAMA Psychiatry 2015
8 The 2015 American Geriatrics Society Beers Criteria, J Am Geriatr Soc, 2015

Top-5 interventions to be avoided in the in Swiss hospital medical practice

1. **Don't order blood tests at regular intervals (such as every day) or routine extensive lab panels including X-rays without specific clinical questions.**

2. **Don't place, or leave in place, urinary catheters for incontinence, convenience or monitoring of output for non-critically ill patients.**

3. **Don't transfuse more than the minimum number of red blood cell (RBC) units necessary to relieve symptoms of anemia or to return a patient to a safe haemoglobin range (7 g/dL in stable non-cardiac patients and 8 g/dL in stable patients with pre-existing cardiovascular disease).**

4. **Don't let older adults lie in bed during their hospital stay. In addition, individual therapeutic goals should be established considering the patients' values and preferences.**

5. **Don't use benzodiazepines or other sedative-hypnotics in older adults as first choice for insomnia, agitation or delirium and avoid prescription at discharge.**

Back-up slides

ONLINE FIRST | LESS IS MORE

Diagnostic Blood Loss From Phlebotomy and Hospital-Acquired Anemia During Acute Myocardial Infarction

Adam C. Salisbury, MD, MSc; Kimberly J. Reid, MS; Karen P. Alexander, MD; Frederick A. Masoudi, MD, MSPH;
Sue-Min Lai, PhD, MS, MBA; Paul S. Chan, MD, MSc; Richard G. Bach, MD; Tracy Y. Wang, MD, MHS, MSc;
John A. Spertus, MD, MPH; Mikhail Kosiborod, MD

20% of patients with acute MI develop moderate to severe hospital-acquired anemia (Hb <11 g/dl):
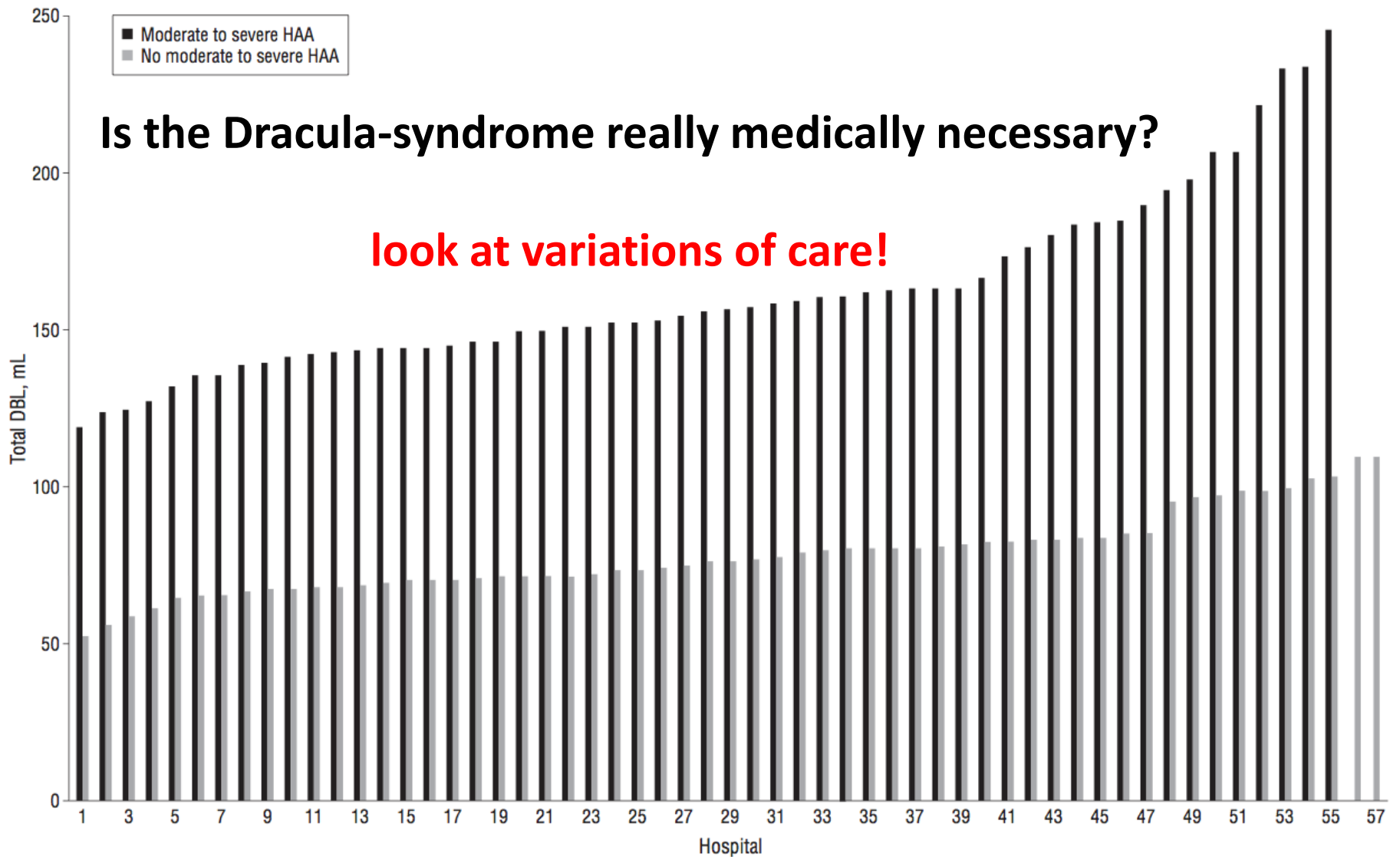
63 ml for chemistry
39 ml for hematology
29 ml for coagulation studies
20 ml for blood cultures
20 ml for ABGA

Figure 2. Variation in mean diagnostic blood loss (DBL) across the 57 hospitals included in a contemporary acute myocardial infarction database (Cerner Corp's Hospital Facts database.) Bars represent shrinkage estimates of the mean DBL for patients' entire hospitalizations across each hospital. Black bars represent the mean value for patients with moderate to severe hospital-acquired anemia (HAA), and gray bars present the mean value for patients without moderate to severe HAA. Hospitals are plotted on the x-axis from the hospital with the smallest mean blood loss to the hospital with the largest, ranked separately among those with moderate to severe HAA and without moderate to severe HAA.

May TA et al., Reducing Unnecessary Inpatient Laboratory Testing in a Teaching Hospital, Am J Clin Pathol 2006

Aim: Minimize unnecessary phlebotomies and laboratory tests by reconfiguring the electronic order function to limit phlebotomy–laboratory test requests to occur singly or to recur within one 24-hour window

Comparison of Inpatient Statistics for Fiscal Year 2002-2003 vs 2003-2004*

	2002-2003	2003-2004	Absolute (%) Difference[†]	Ordering Rate Ratio (95% CI)[‡]	P
Inpatient admissions	17,850	17,553	−297 (−1.7)	—	—
Inpatient admission days	115,715	114,936	−779 (−0.7)	—	—
Inpatient days/inpatient	6.48	6.55	0.07 (0.1)	—	—
Total inpatient laboratory tests[§]	604,847	532,208	−72,639 (−12.0)	—	—
Average laboratory tests/inpatient	33.9	30.3	−3.6 (−10.6)	—	—
Average laboratory tests/inpatient day	5.2	4.6	−0.6 (−11.5)	0.89 (0.88-0.89)	<.0001
Total inpatient phlebotomies performed	80,294	63,087	−17,207 (− 21.4)	—	—
Average phlebotomies performed/inpatient day	0.69	0.55	−0.14 (−20.3)	0.79 (0.78-0.80)	<.0001
Total laboratory tests performed (inpatient and outpatient, including for ED)	1,112,689	1,142,958	30,269 (2.7)	—	—
Total outpatient laboratory tests performed	429,990	484,836	54,846 (12.8)	—	—
Total laboratory tests performed for ED	77,852	93,142	15,290 (19.6)	—	—

- 12% fewer inpatient tests, of which 57.5% were related directly to decreases in the 5 most frequently ordered tests.

- Reduction of phlebotomies by 20%.

- Cost savings & new labor capacity

Overall Survival May Be Improved with Restrictive Transfusion in Patients with Upper GI Bleeding

Villanueva C et al., Transfusion Strategies for Acute Upper Gastrointestinal Bleeding , N Engl J Med 2013

921 GI bleed patients			
	Restrictive Transfusion (Trigger <**7**g/dL)	Liberal Transfusion (Trigger <**9**g/dL)	P-value
# of Patients	461	460	
6-weeks survival	95%	91%	p = 0.02
Bleeding	10%	16%	p = 0.01

1 center (Barcelona), June 2003 – Dec 2009

# Relationship between Age and Functional Decline

Covinsky KE et al., Loss of Independence in Activities of Daily Living in Older Adults Hospitalized with Medical Illnesses: Increased Vulnerability with Age, Journal of the American Geriatrics Society 2003

	Age					
	70–74	75–79	80–84	85–89	≥90	*P*-value
Outcome	Odds Ratio* (95% Confidence Interval)					for trend
Decline between 2 weeks before admission and discharge (N = 2,293)	1.0	1.21 (0.92–1.60)	1.52 (1.14–2.03)	2.23 (1.60–3.09)	2.67 (1.81–3.92)	<.001
Decline before hospitalization (N = 2,293)	1.0	1.23 (0.97–1.57)	1.02 (0.79–1.33)	1.14 (0.84–1.55)	1.26 (0.88–1.82)	.39
Decline during hospitalization in patients who did not decline before hospitalization (n = 1,311)	1.0	1.31 (0.86–2.00)	1.75 (1.14–2.69)	2.89 (1.78–4.69)	3.43 (1.92–6.12)	<.001
Failure to recover during hospitalization in patients who declined before hospitalization (n = 982)	1.0	0.98 (0.66–1.45)	1.37 (0.90–2.09)	1.72 (1.06–2.77)	2.09 (1.20–3.65)	<.001

* Adjusted for gender, ethnicity, number of independent instrumental activities of daily living at baseline, number of independent activities of daily living at baseline, Charlson comorbidity score, chart diagnosis of dementia, acute physiology score, serum albumin, and whether interviews were obtained with a surrogate.

Many hospitalized elderly are discharged with worse activities of daily living function than their baseline function

Covinsky KE et al., Loss of Independence in Activities of Daily Living in Older Adults Hospitalized with Medical Illnesses: Increased Vulnerability with Age, Journal of the American Geriatrics Society 2003

Bathing

Dressing

Transferring

Toileting

Eating

Legend

Independent

Dependent
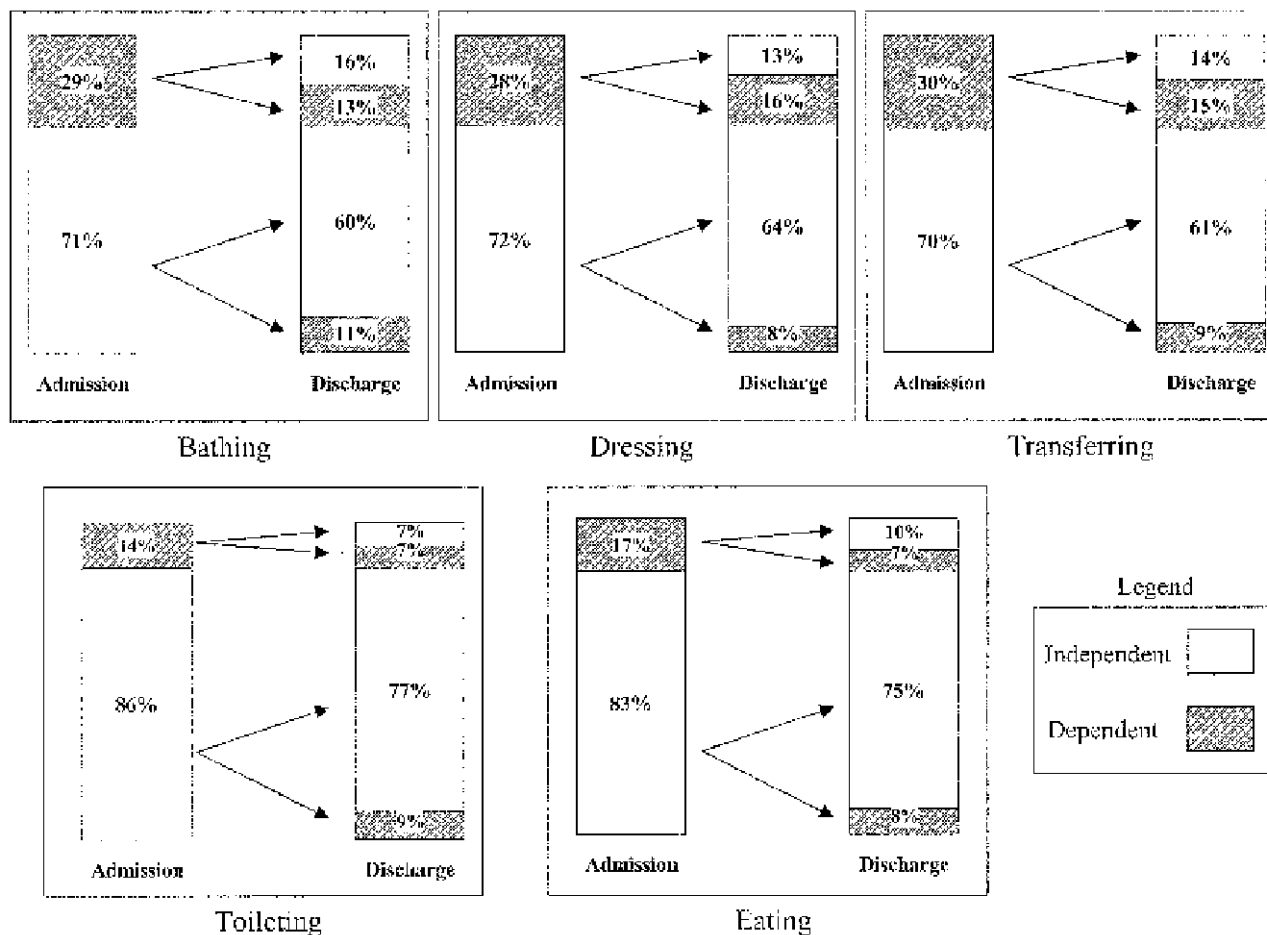
Conceptual model of how nurses decide to mobilize older adult patients
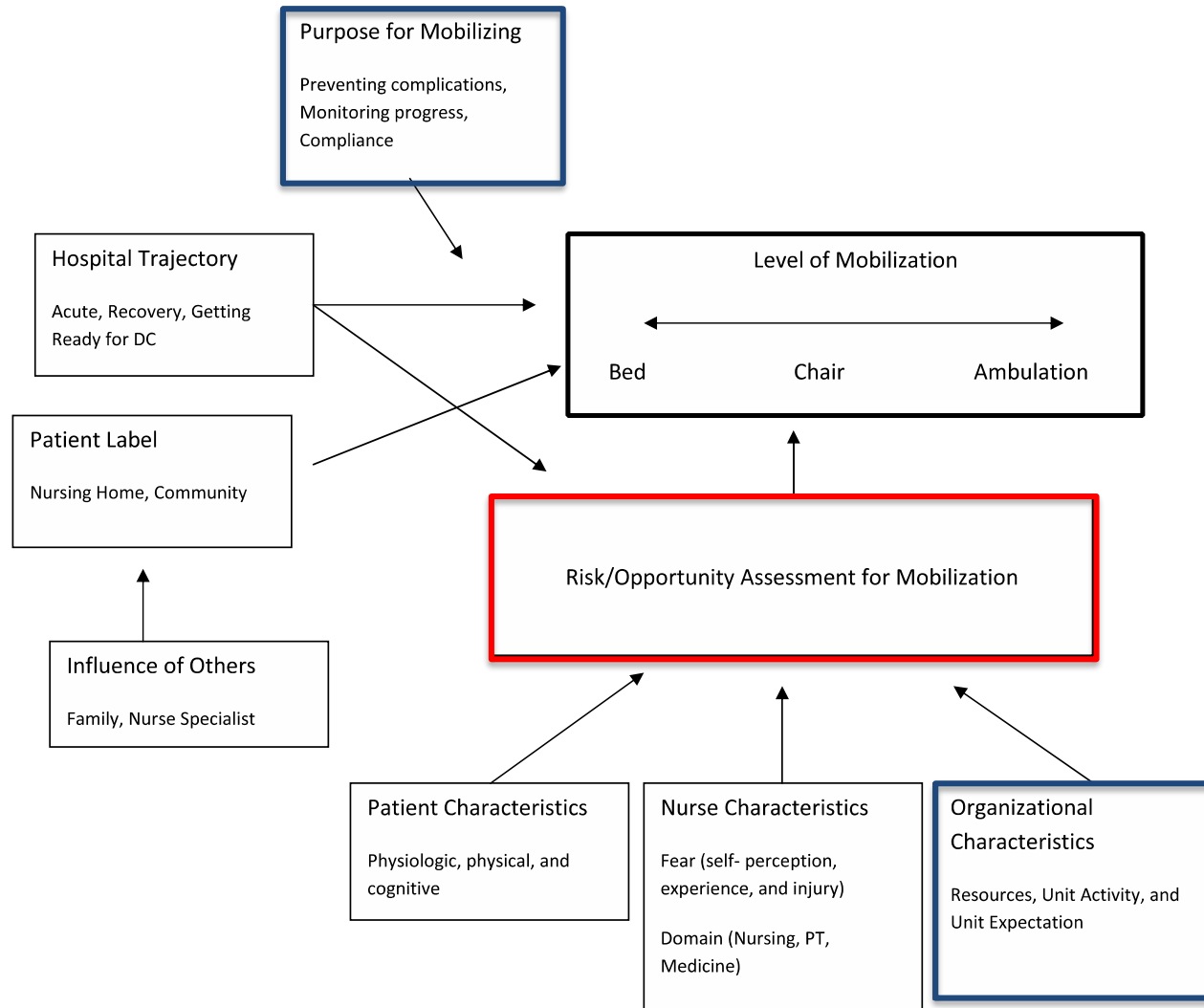
Zolpidem is unlikely to be a safer alternative to BZDs in older adults

Finkle WD et al., Risk of Fractures Requiring Hospitalization After an Initial Prescription for Zolpidem, Alprazolam, Lorazepam, or Diazepam in Older Adults, J Am Geriatr 2011

Table 2. Nonvertebral Fractures and Dislocations (*International Classification of Diseases, Ninth Revision, Clinical* Modification, codes 800–839, Excluding 805 and 806) and for Hip Fractures (820) per 1,000 Person-Years (PY) Between January 1, 1999, and September 30, 2009 in Patients Aged 65 and Older. Before Treatment and in the First 90 days After an Initial Prescription for Zolpidem, Alprazolam, Lorazepam, or Diazepam

Fracture	Zolpidem	Alprazolam	Lorazepam	Diazepam
N	10,857	20,429	42,080	16,372
Adjusted N	–	14,939.9	29,793.8	10,150.0
Nonvertebral				
Pretreatment rate/1,000 PY (95% CI)	6.76 (5.63–7.89)	8.44 (7.12–9.77)	8.25 (7.53–8.98)	8.90 (6.95–10.85)
Posttreatment rate/ 1,000 PY (95% CI)	17.23 (11.94–22.51)	9.65 (6.41–12.89)	12.61 (10.04–15.19)	17.50 (9.66–25.34)
RR (95% CI) *P*-value	2.55 (1.78–3.65) <.001	1.14 (0.80–1.64) .42	1.53 (1.23–1.91) <.001	1.97 (1.22–3.18) .01
RRR* (95% CI) *P*-value	–	2.23 (1.36–3.66) .006	1.68 (1.12–2.53) .02	1.29 (0.72–2.30) .32
Hip				
Pretreatment rate/1,000 PY (95% CI)	3.52 (2.69–4.36)	4.25 (3.26–5.23)	4.05 (3.55–4.54)	3.56 (2.30–4.83)
Posttreatment rate/1,000 PY (95% CI)	10.94 (6.77–15.11)	6.20 (3.60–8.81)	8.29 (6.38–10.21)	7.25 (2.62–11.88)
RR (95% CI) *P*-value	3.11 (1.96–4.91) <.001	1.46 (0.91–2.35) .1	2.05 (1.58–2.66) <.001	2.03 (1.03–4.00) .04
RRR* (95% CI) *P*-value	–	2.13 (1.11–4.07) .03	1.53 (0.91–2.56) .1	1.50 (0.68–3.35) .23

* Rate ratio (RR) zolpidem/RR comparator drug.
CI = confidence interval; RRR = ratio of RR.