HOW TO USE QUALITY REGISTRY DATA FOR QUALITY IMPROVEMENT

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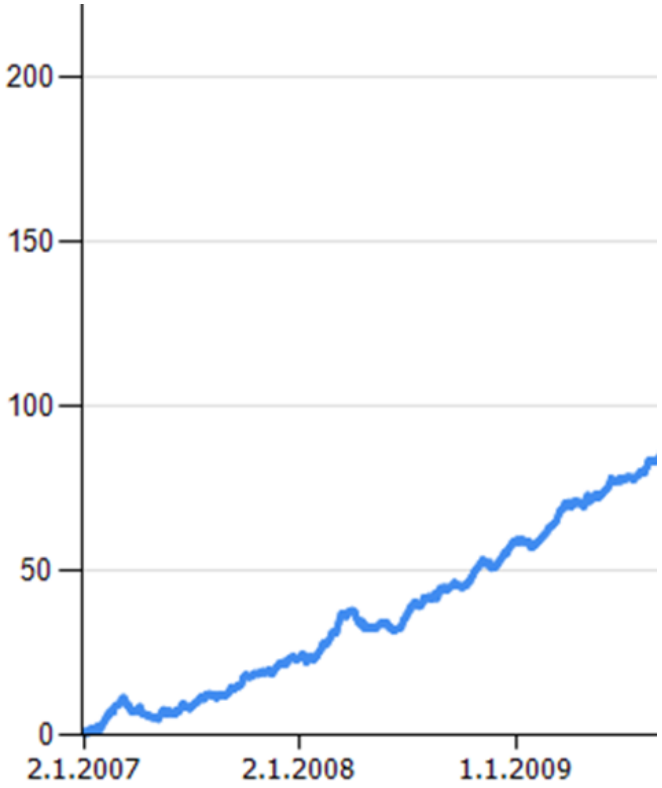
Siun SOTE

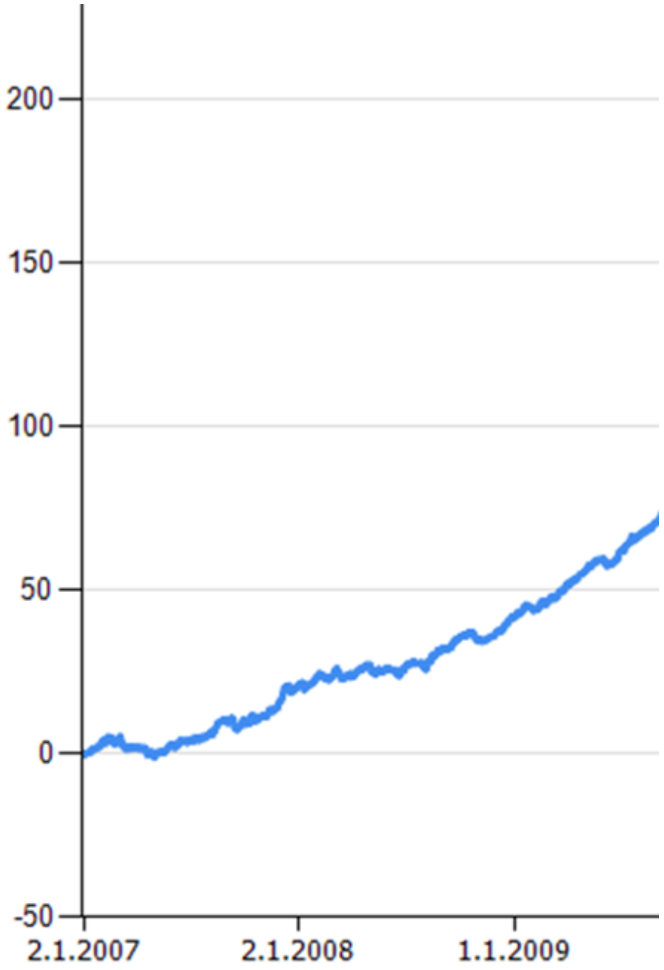
DOES A QUALITY REGISTRY IMPROVE QUALITY?

… or is it just useless data collection?

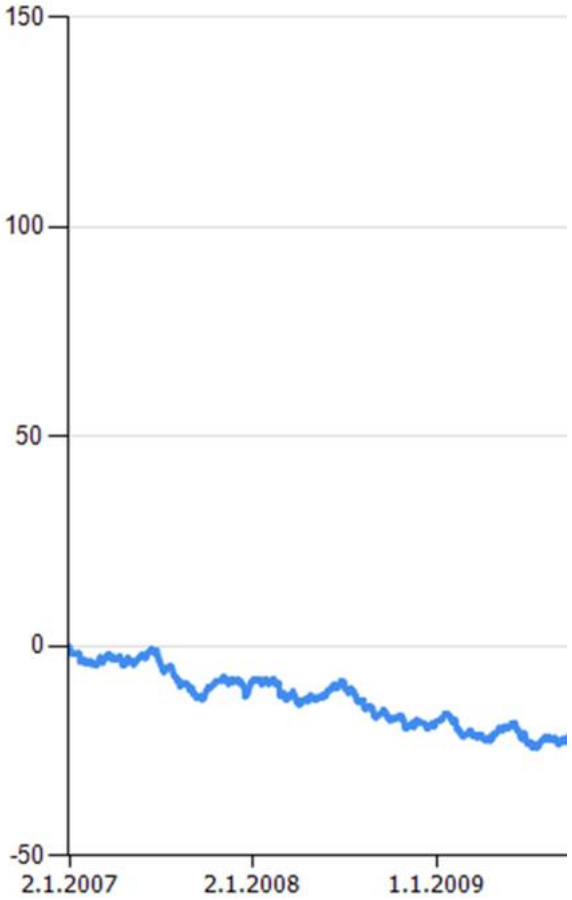
VLAD (variable life adjusted display):
cumulative difference between predicted and observed number of deaths



Dept A

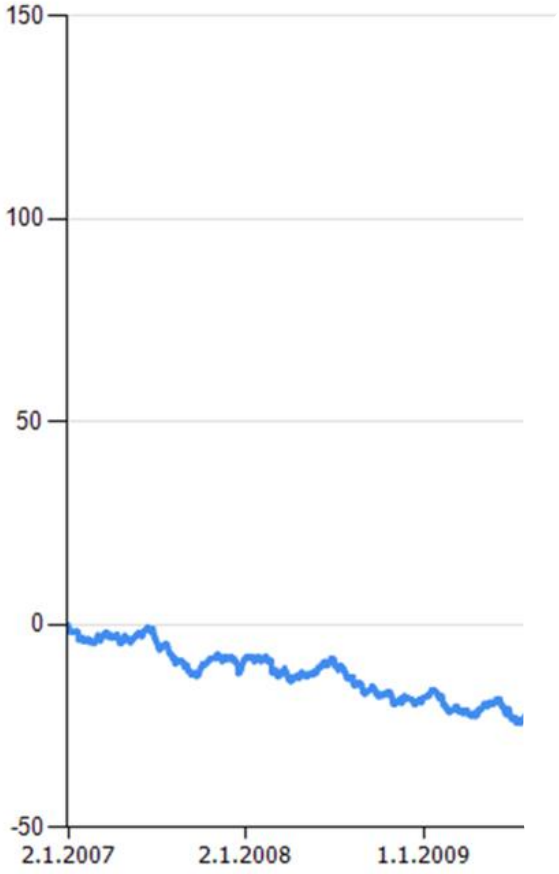


Dept B



Dept C

VLAD (variable life adjusted display):
cumulative difference between predicted and observed number of deaths



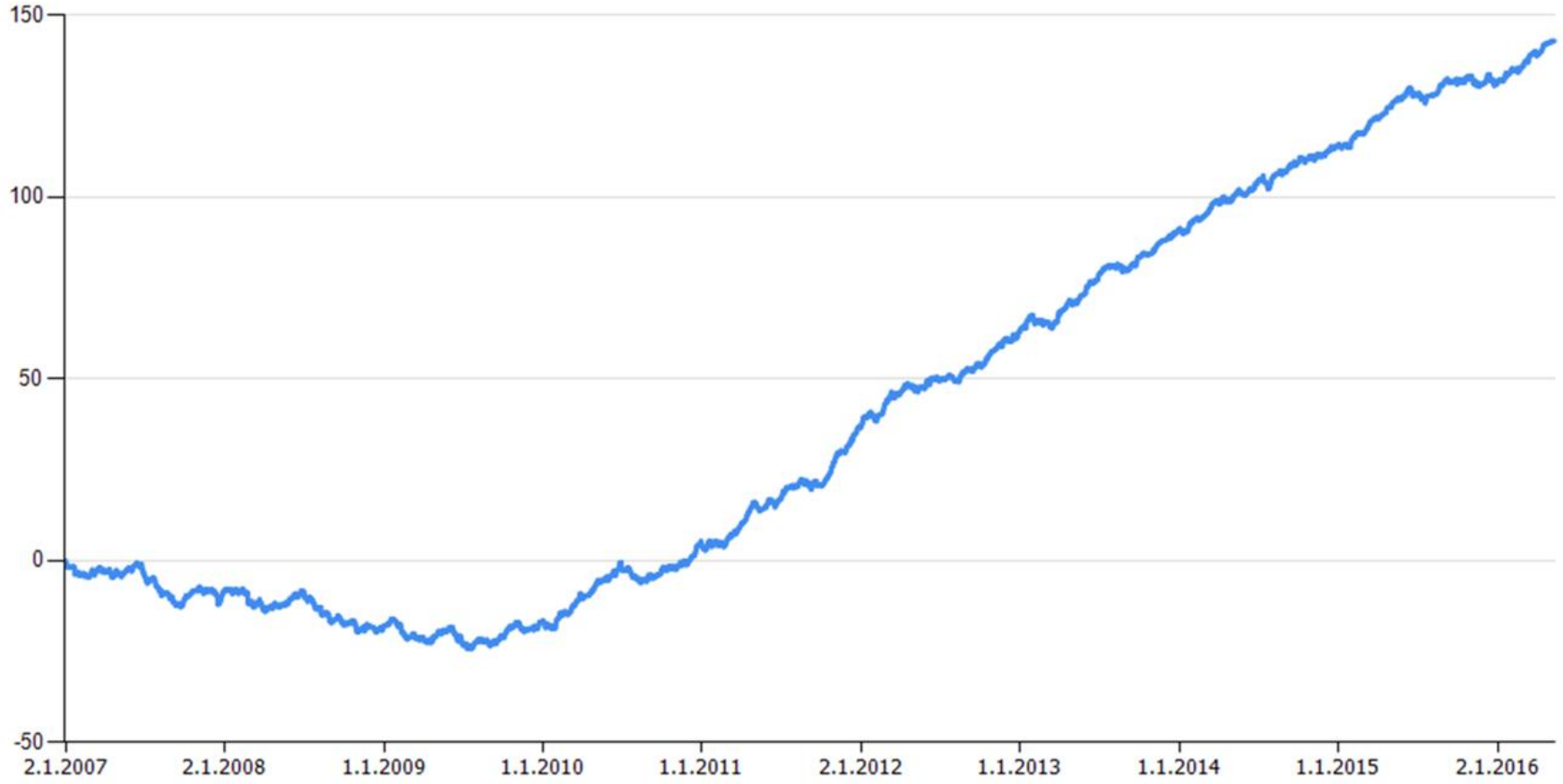
Dept C

- Shortage of beds, leading to untimely discharges from the ICU
- Relatively high post-ICU mortality

✓ The number of intermediate-care beds was increased

✓ Length of ICU stay was intentionally increased for high-risk patients

VLAD (variable life adjusted display):
cumulative difference between predicted and observed number of deaths



Dept C

DID THE QUALITY REGISTRY IMPROVE QUALITY?

- A registry in itself does not improve quality
- However, if
  - the data are trustworthy
  - you analyse the data and pay attention to the results
  - you find the factors explaining the differences
  - you take action

➢ Quality improvements may happen

Does telling people what they have been doing change what they do? A systematic review of the effects of audit and feedback.
Jamtvedt G et al. *Qual Saf Health Care* 2006; 15 (6): 433-6.

- the impact of feedback is probably larger when

- the baseline level of performance is low and

- intensity of audit and feedback is high

STRIVING FOR QUALITY IMPROVEMENT: MORTALITY

- It is seldom possible to find ways for quality improvement by looking only at overall mortality rates (crude or adjusted), because
  - mortality may not be a sensitive indicator: there may be quality problems that are not detected by mortality comparisons
  - there are numerous sources of bias

DOES IT MAKE SENSE TO COMPARE MORTALITY RATES?

- Spanish-American war, 1898:

- The death rate in the US Navy was 9/1000

- During the same period, the death rate for civilians in New York City was 16/1000

- Navy recruiters used these data to demonstrate that it was safer to be in the navy than out of it.

  (Darrell Huff: How to lie with statistics, 1954)

➢ Case-mix differences must be taken into account, if mortality rates of different ICUs are compared

PITFALLS IN STANDARDISED MORTALITY RATIO (SMR) CALCULATIONS

1) Poor fit of the risk-adjustment model
2) Factors affecting the measurement of severity of illness
3) The measurement of mortality – bias caused by differences in hospital discharge practices
4) Random variation
5) Yule-Simpson’s paradox

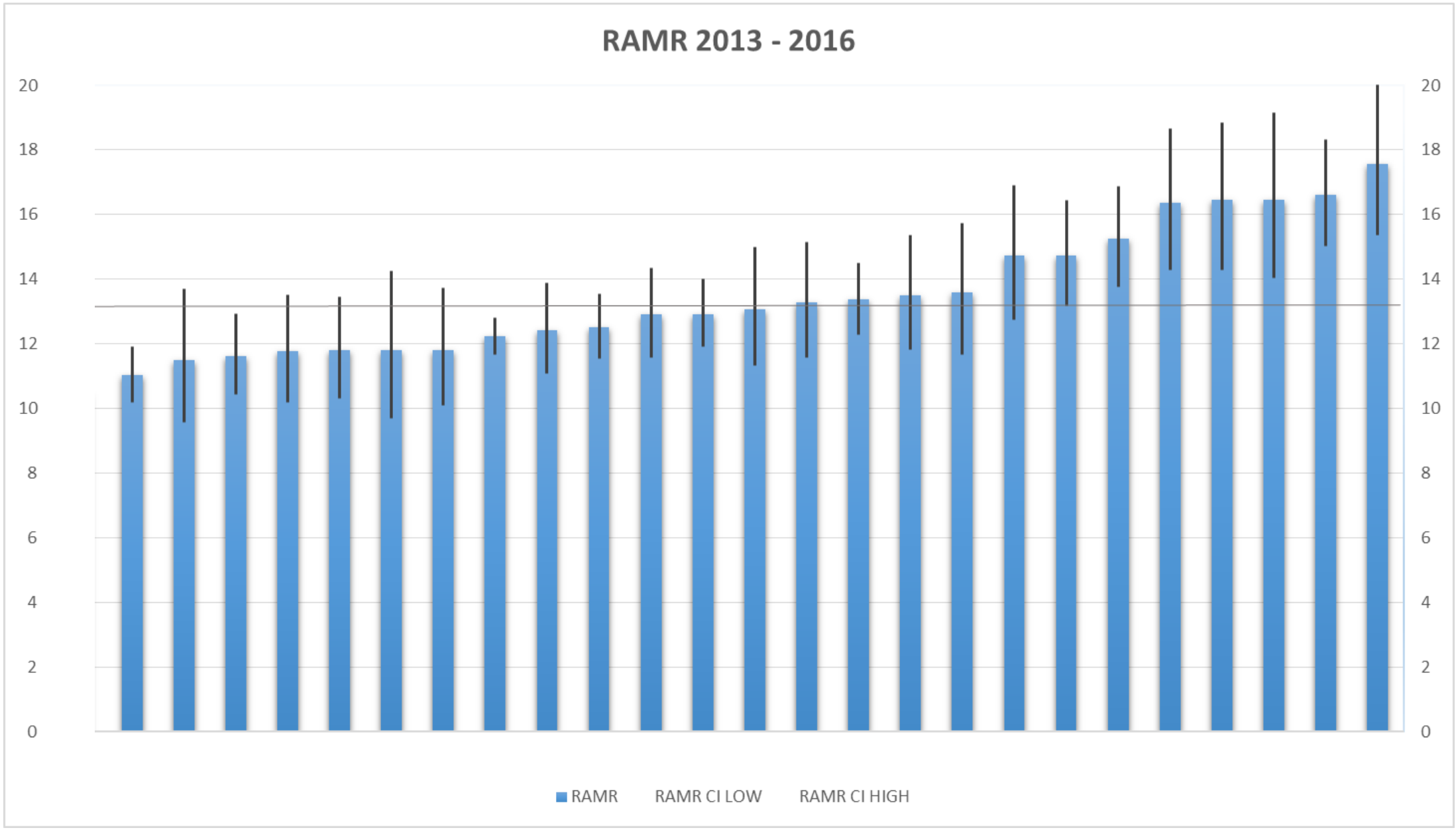
RANDOM VARIATION

Angus D. Scoring system fatigue … and the search for a way forward. *Crit Care Med* 2000; 28: 2145-2146.

- ”When generating SMRs, … set a minimum number of observations.”
- ”Interpret SMRs with caution. … even if statistically significantly different … may represent random variation. I would recommend that attention … be concentrated on ICUs that are consistently higher or lower than expected.”

Verburg IW et al. Individual and Clustered Rankability of ICUs According to Case-Mix-Adjusted Mortality. *Crit Care Med* 2016 May;44(5):901-9.

- Small sample sizes (from one single year) lead to uncertainty
- Differences between hospitals may be determined by chance
- ”We conclude that the rankability of … Dutch ICUs based on risk-adjusted mortality rate was unacceptably low. We could improve the rankability … by increasing the period of data collection…” (from 1 to 3 years)



ICUs in the Finnish Intensive Care Consortium – data collection period 4 yrs

YULE-SIMPSON'S PARADOX

- An association that is seen in several groups can be modified or even reversed when the groups are combined

  George Udny Yule 1903, Edward H. Simpson 1951

HYPOTHETICAL EXAMPLE

- ICUs A and B participate in a benchmarking programme that uses a perfect risk prediction model
- For ICU A:
  - mortality of low-to-medium risk (0.2) patients was as expected
  - mortality of high-risk (0.3) patients was 10% higher than expected
- For ICU B:
  - mortality of low-to-medium risk (0.2) patients was 5% higher than expected
  - mortality of high-risk (0.3) patients was 20% higher than expected
- Which ICU has the lowest SMR?
  - ✓Presumably ICU A has a lower SMR, as it seems to have performed better among both low-to-medium risk and high-risk patients, right?

	ICU A	ICU B
Low-to-medium risk (0.2) patients, n		
Observed deaths		
Expected deaths		
High-risk (0.3) patients, n		
Observed deaths		
Expected death		
All patients, n	1000	1000
Observed deaths		
Expected deaths		
SMR (= O/E ratio)		

	ICU A	ICU B
Low-to-medium risk (0.2) patients, n	200	900
Observed deaths	40	189
Expected deaths	40	180
High-risk (0.3) patients, n	800	100
Observed deaths	264	36
Expected death	240	30
All patients, n	1000	1000
Observed deaths	304	225
Expected deaths	280	210
SMR (= O/E ratio)	**1.09**	**1.07**

	ICU A	ICU B
Low-to-medium risk (0.2) patients, n	200	900
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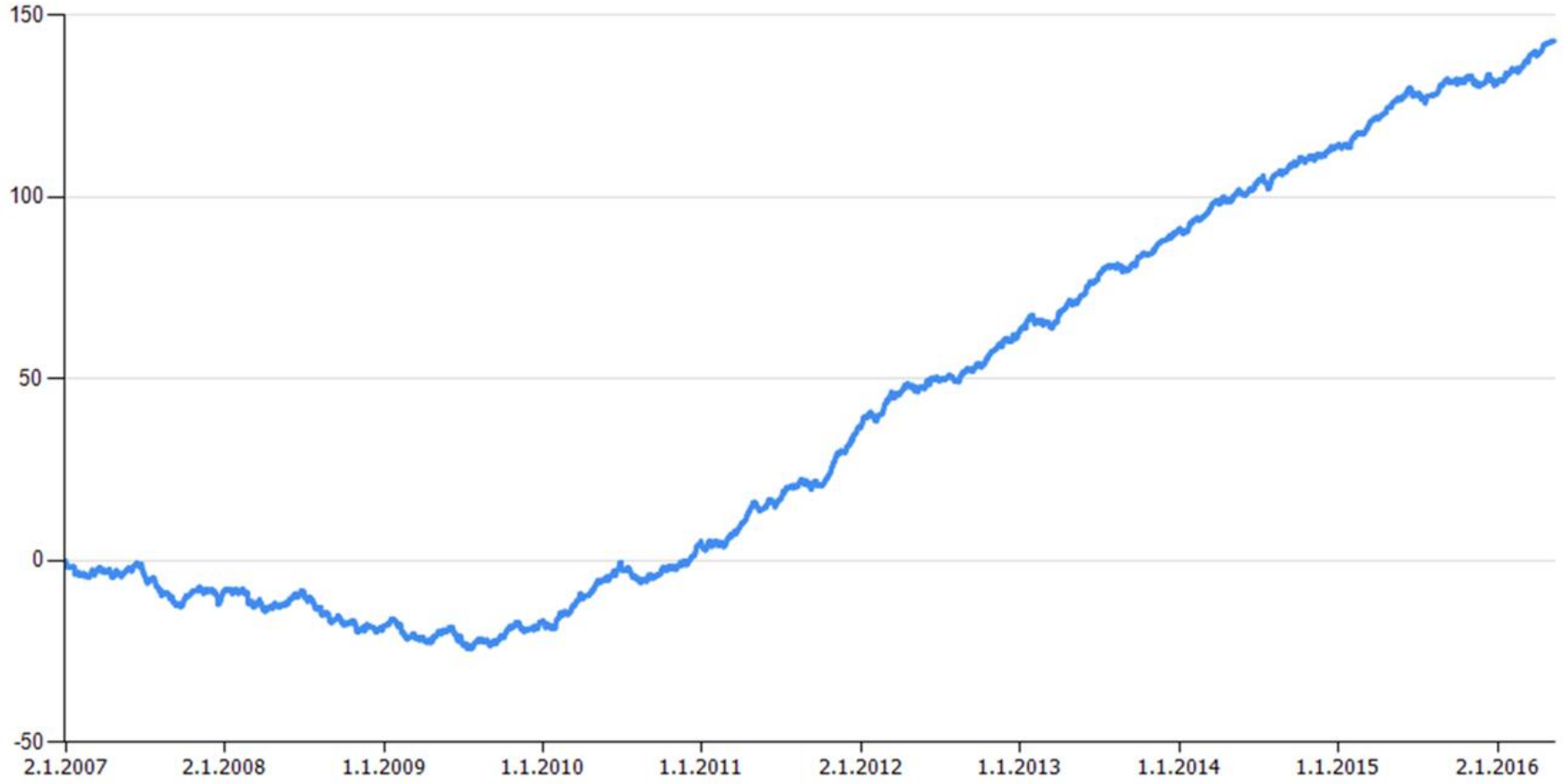
Observed deaths	264	36
Expected death	240	30
All patients, n	1000	1000
Observed deaths	304	225
Expected deaths	280	210
SMR (= O/E ratio)	**1.09**	**1.07**

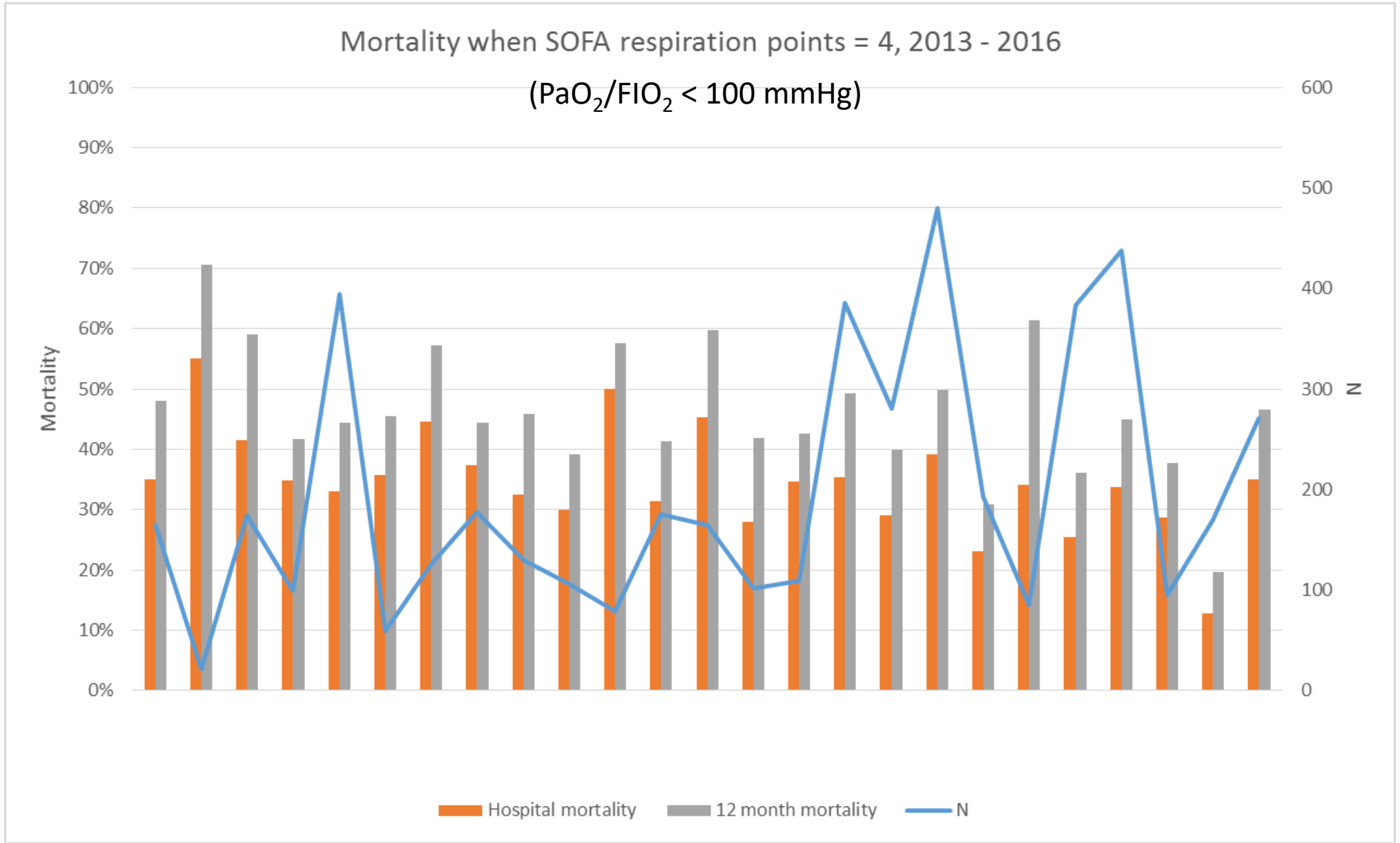
ICU B has a lower SMR despite poorer outcomes for both low-risk and high-risk patients!

VLAD (variable life adjusted display):
cumulative difference between predicted and observed number of deaths



Dept C

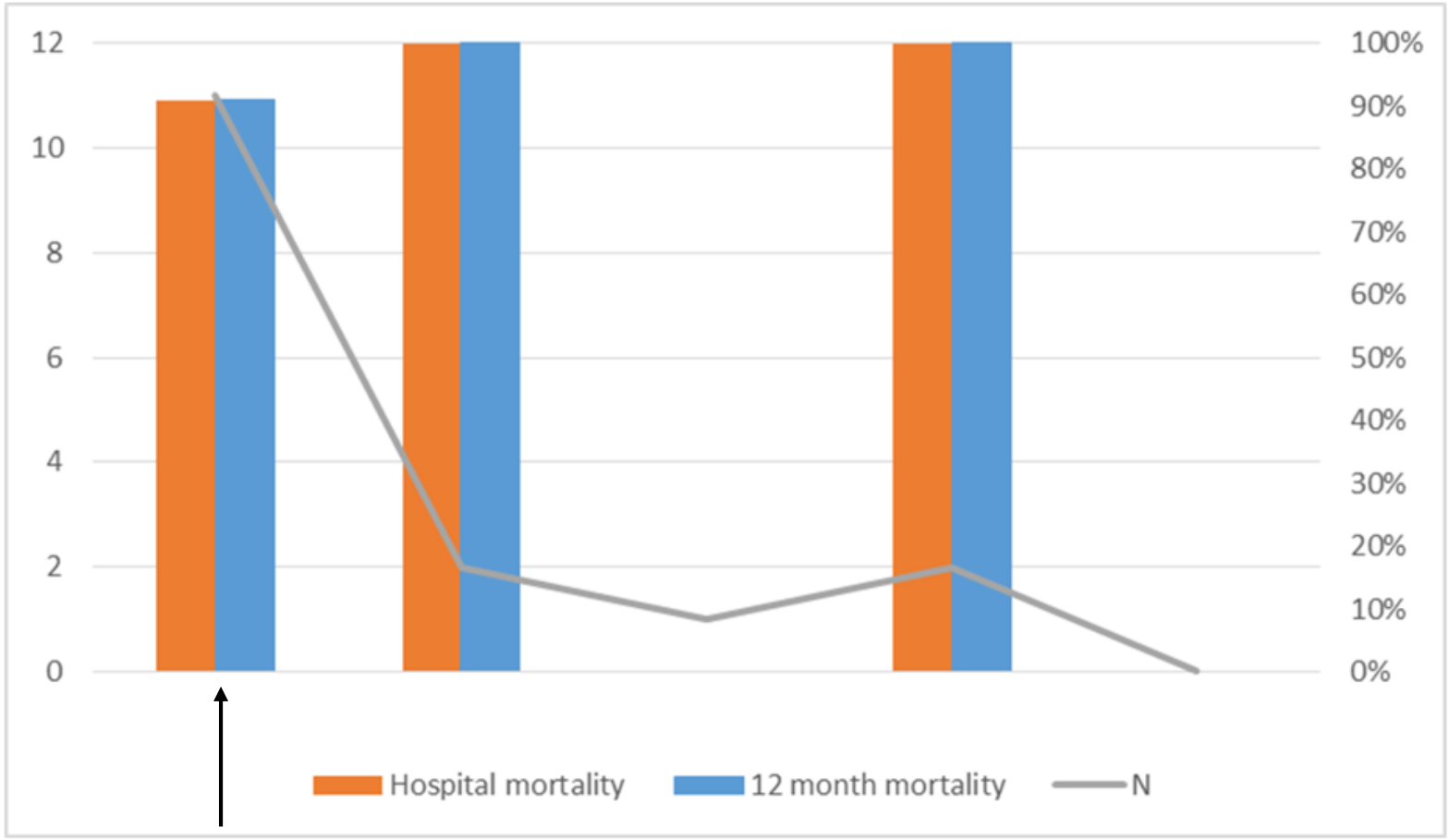
STRIVING FOR QUALITY IMPROVEMENT: FOCUSING ON CERTAIN GROUPS OF PATIENTS


Mortality when SOFA respiration points = 4, 2013 - 2016
(PaO_2/FIO_2 < 100 mmHg)
Mortality
N
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
600
500
400
300
200
100
0
Hospital mortality
12 month mortality
N

STRIVING FOR QUALITY IMPROVEMENT: IDENTIFYING PATIENTS WHO ARE UNLIKELY TO BENEFIT FROM INTENSIVE CARE

VERY OLD PATIENTS RESUSCITATED FROM CARDIAC ARREST WITH A NON-SHOCKABLE PRIMARY RHYTHM

A group of large Finnish ICUs, 2013-2014; patients aged > 80 yrs and resuscitated from OHCA with non-shockable initial rhythm



Dept X; patients aged > 80 yrs
and resuscitated from OHCA with non-shockable initial rhythm

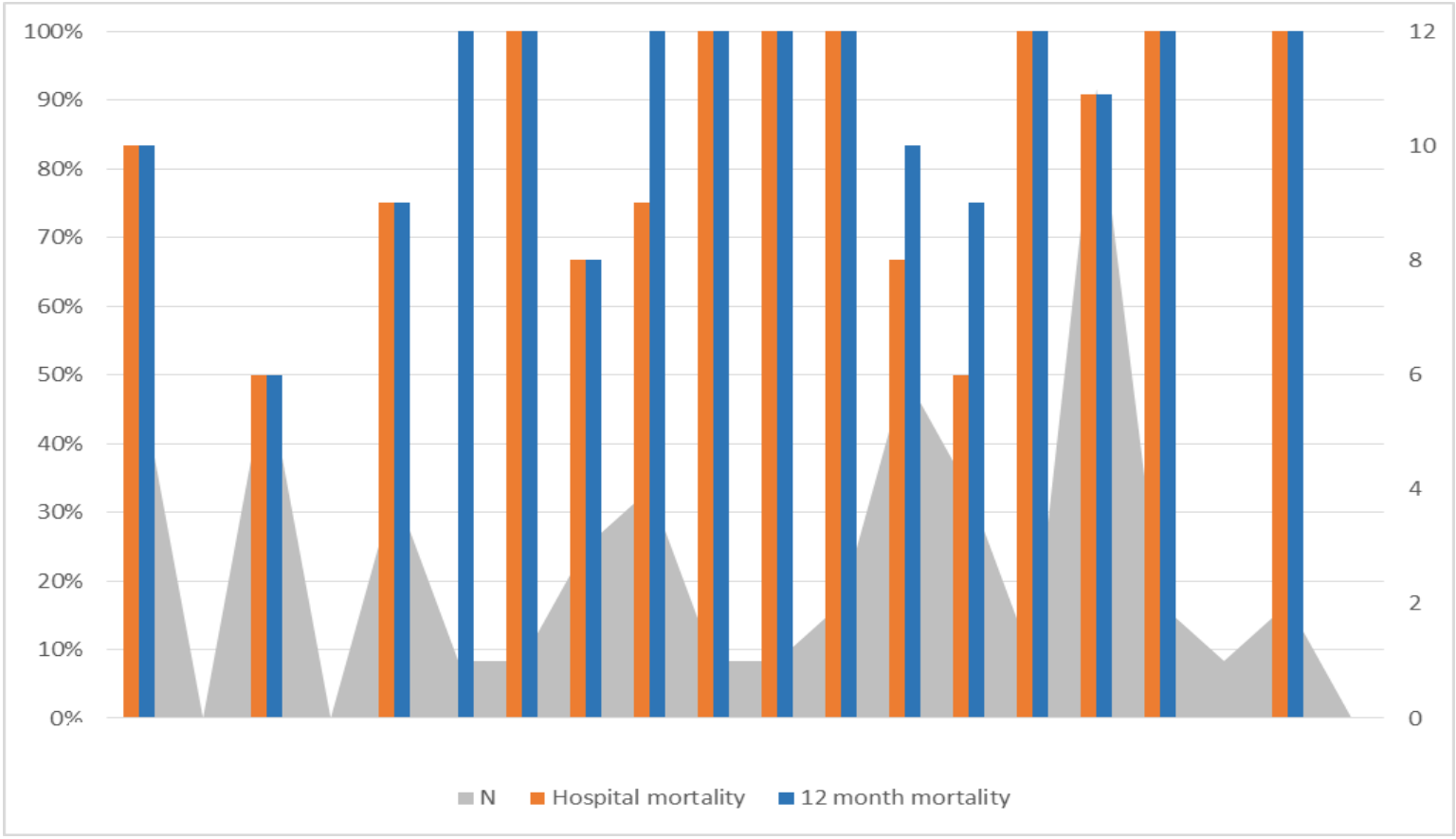
2015: 0

2016: 0

2017: ???

(NB! Even in a group with generally poor prognosis, there may be patients who might benefit from intensive care.)

Finland 2013-2014: ICU patients aged 80 yrs or over, resuscitated from out-of-hospital cardiac arrest with a non-shockable initial rhythm (PEA/ASY); n, hospital mortality and 12-mth mortality by department



Overall, n = 56, hospital mortality 75%, 12-mth mortality 82%

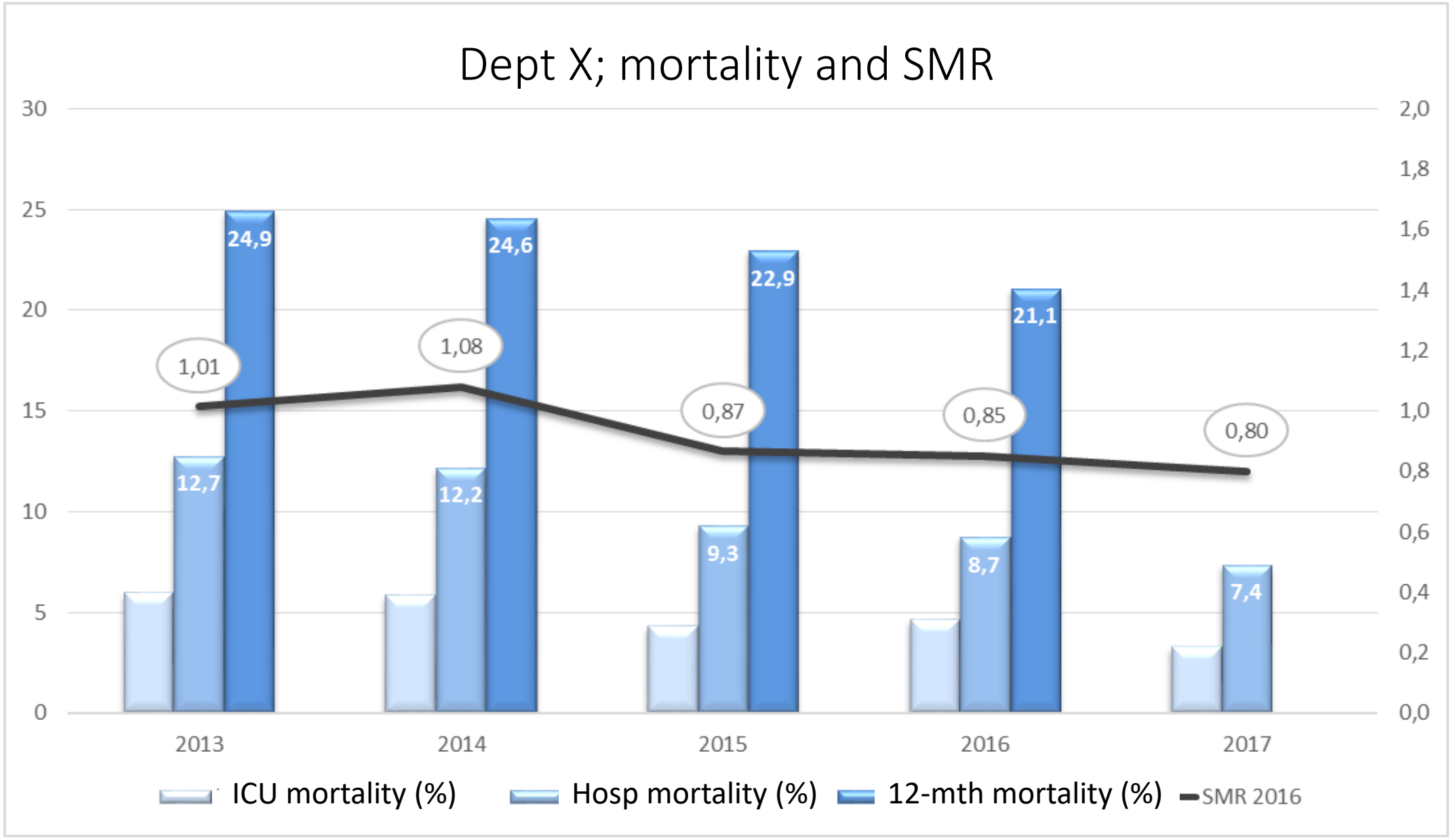
Dept X; patients aged > 80 yrs
and resuscitated from OHCA with non-shockable initial rhythm

2015: 0

2016: 0

2017: 3

(NB! Even in a group with generally poor prognosis, there may be patients who might benefit from intensive care.)


Dept X; mortality and SMR
30
25
20
15
10
5
0
2,0
1,8
1,6
1,4
1,2
1,0
0,8
0,6
0,4
0,2
0,0
24,9
24,6
22,9
21,1
7,4
12,7
12,2
9,3
8,7
1,01
1,08
0,87
0,85
0,80
2013
2014
2015
2016
2017
ICU mortality (%)
Hosp mortality (%)
12-mth mortality (%)
SMR 2016

VERY OLD PATIENTS WITH POOR LEVEL OF CONSCIOUSNESS

Available online http://ccforum.com/content/11/2/R33

Crit Care 2007; 11(2): R33

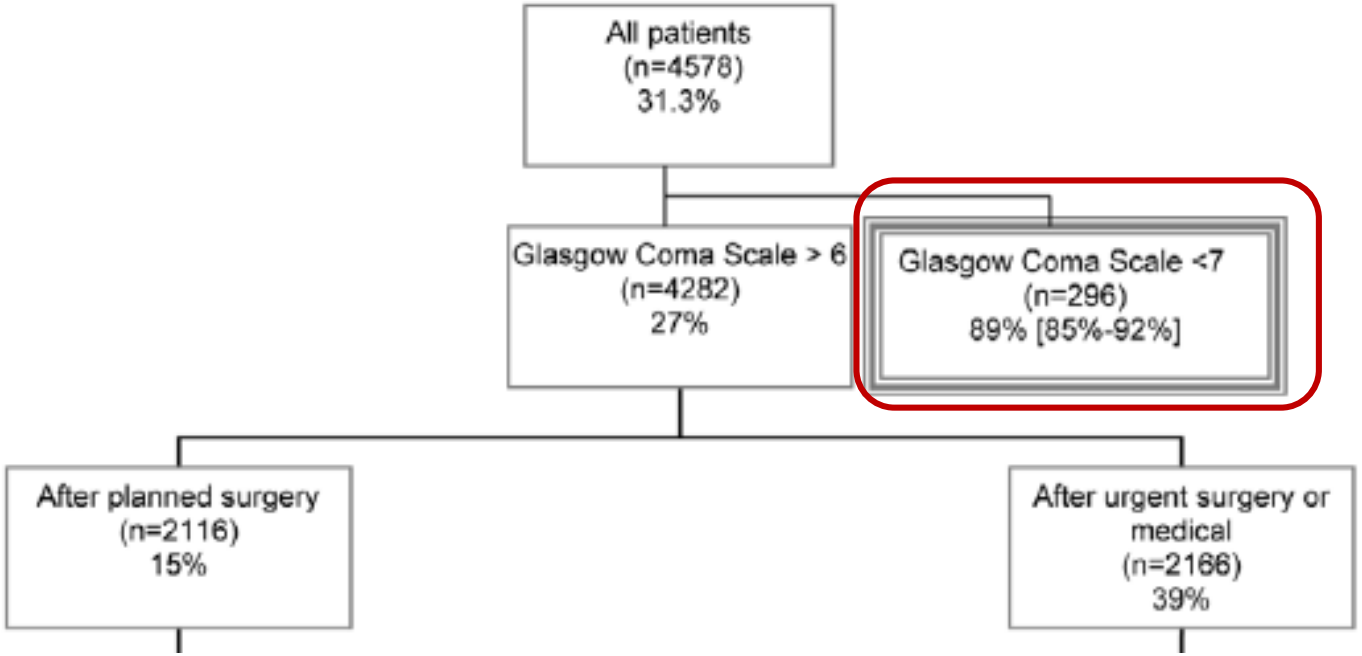
Research

Open Access

Identification of high-risk subgroups in very elderly intensive care unit patients

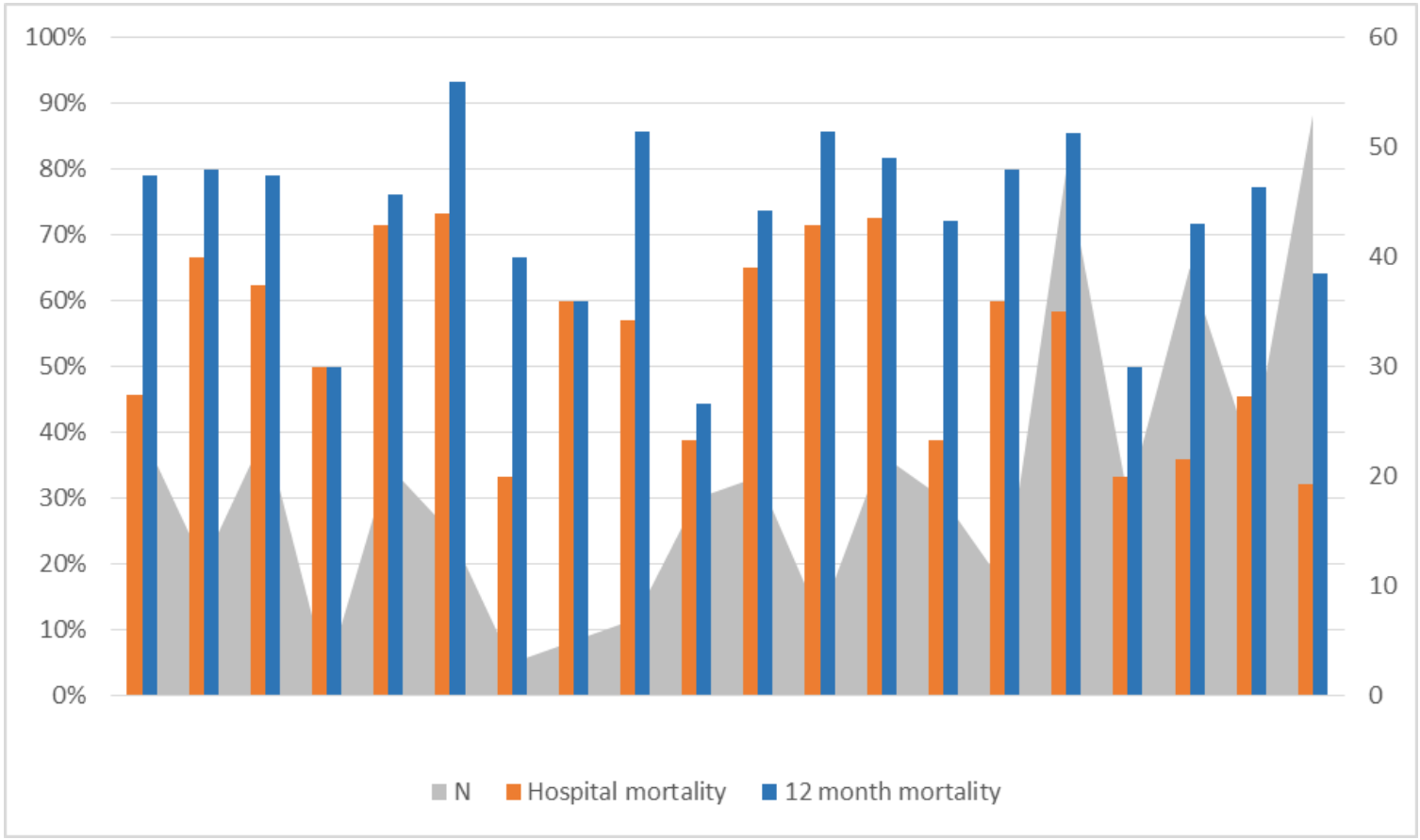
Sophia E de Rooij[1], Ameen Abu-Hanna[2], Marcel Levi[3] and Evert de Jonge[4]

Figure 1



Classification tree to predict mortality before hospital discharge in ICU patients 80 yrs old or older

Finland 2013-2014: ICU patients aged 80 yrs or over with GCS < 7, n, hospital mortality and 12-mth mortality by department



Overall, n = 390, hospital mortality 51%, 12-mth mortality 74%

VERY OLD PATIENTS WITH FAILURE OF MULTIPLE ORGAN SYSTEMS

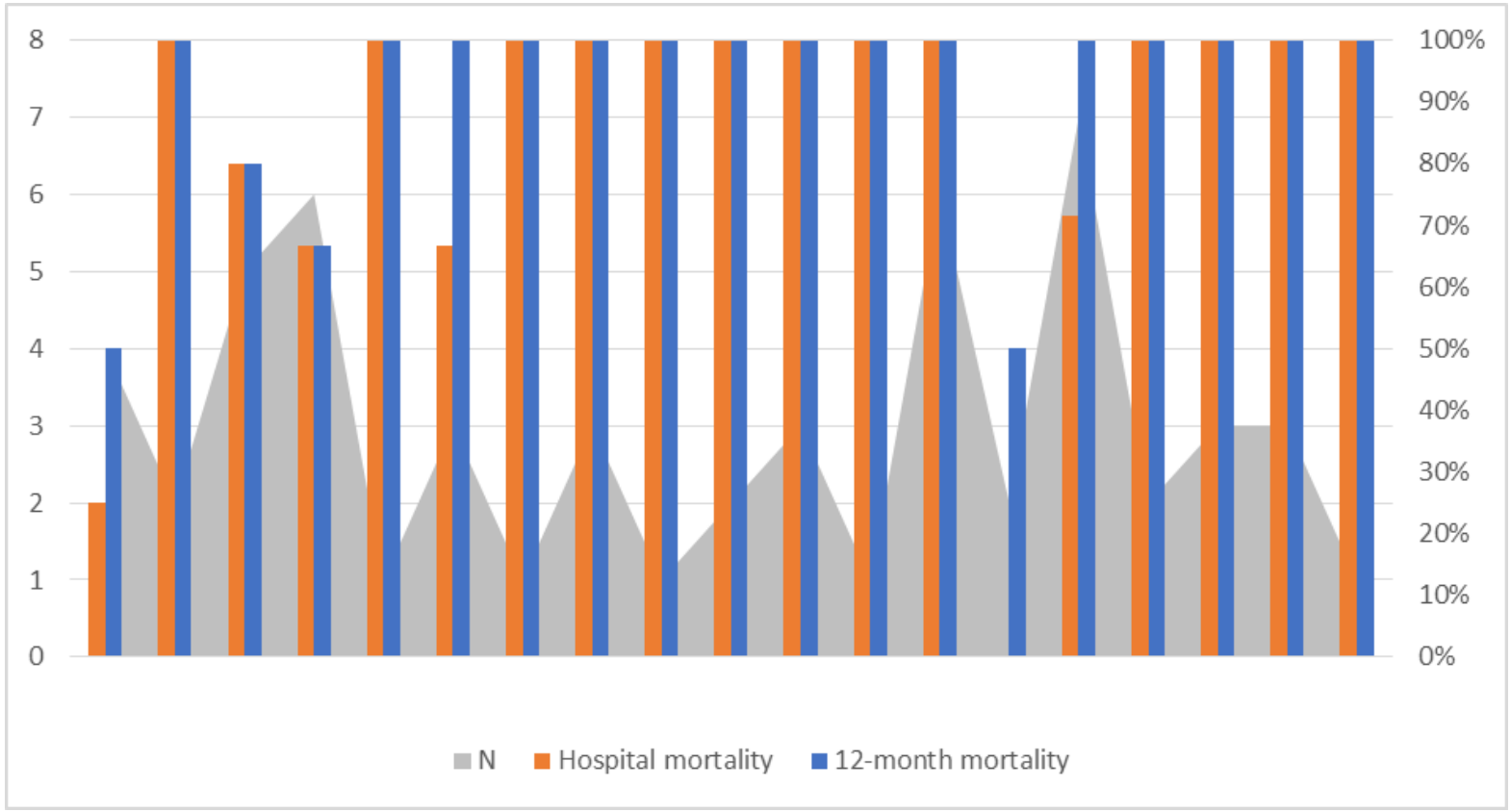
SOFA

- The SOFA score describes organ dysfunctions
- 6 organ systems (CNS, respiratory, circulatory, renal, hepatic, hematologic)
- For each system, 0 = normal function;
  4 = most severe dysfunction / failure

✓Vincent JL et al. Use of the SOFA score to assess the incidence of organ dysfunction/failure in intensive care units: results of a multicenter, prospective study. *Crit Care Med* 1998; 26: 1793-800.

- Mortality > 90% among patients with a SOFA score > 15

Finland 2013-2014: ICU patients aged 80 yrs or over with first day SOFA 15 or over;
n, hospital mortality and 12-mth mortality by department



Overall, n = 56, hospital mortality 80%, 12-mth mortality 89%

Case presentation

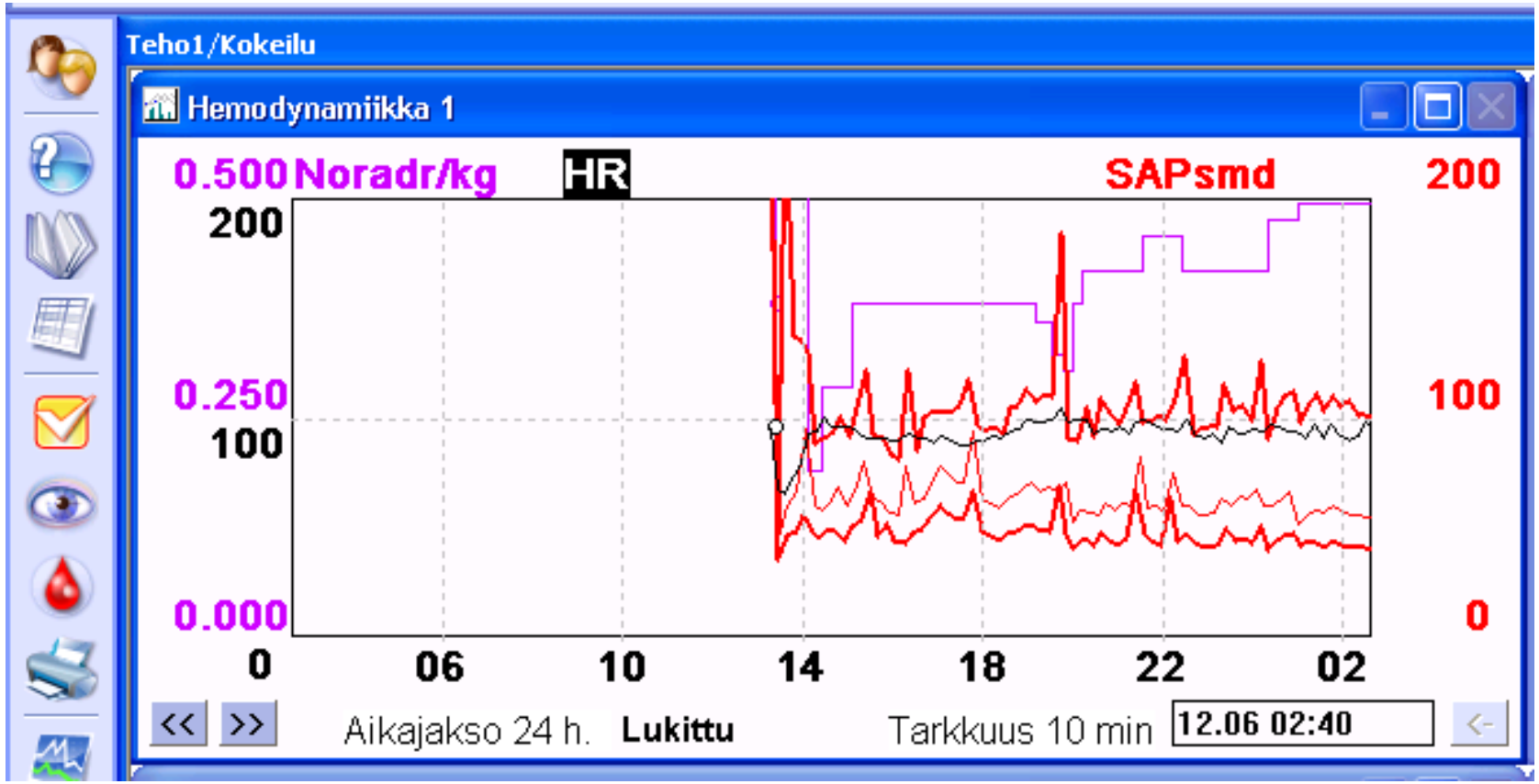
- 86-year-old woman, lives with her daughter,
  no severe functional limitations
- Chronic disease: hypertension
- *Carcinoma uteri* diagnosed 2 yrs earlier; refused surgical treatment; hormonal treatment going on, no metastases detected so far
- To hospital because of gastric pain and vomiting
- Dg: cholangitis; *Enterobacter* species in blood cultures

- Quickly deteriorating condition
- aB-pH 7,11, BE -12,3 mmol/l, lactate 5,8 mmol/l

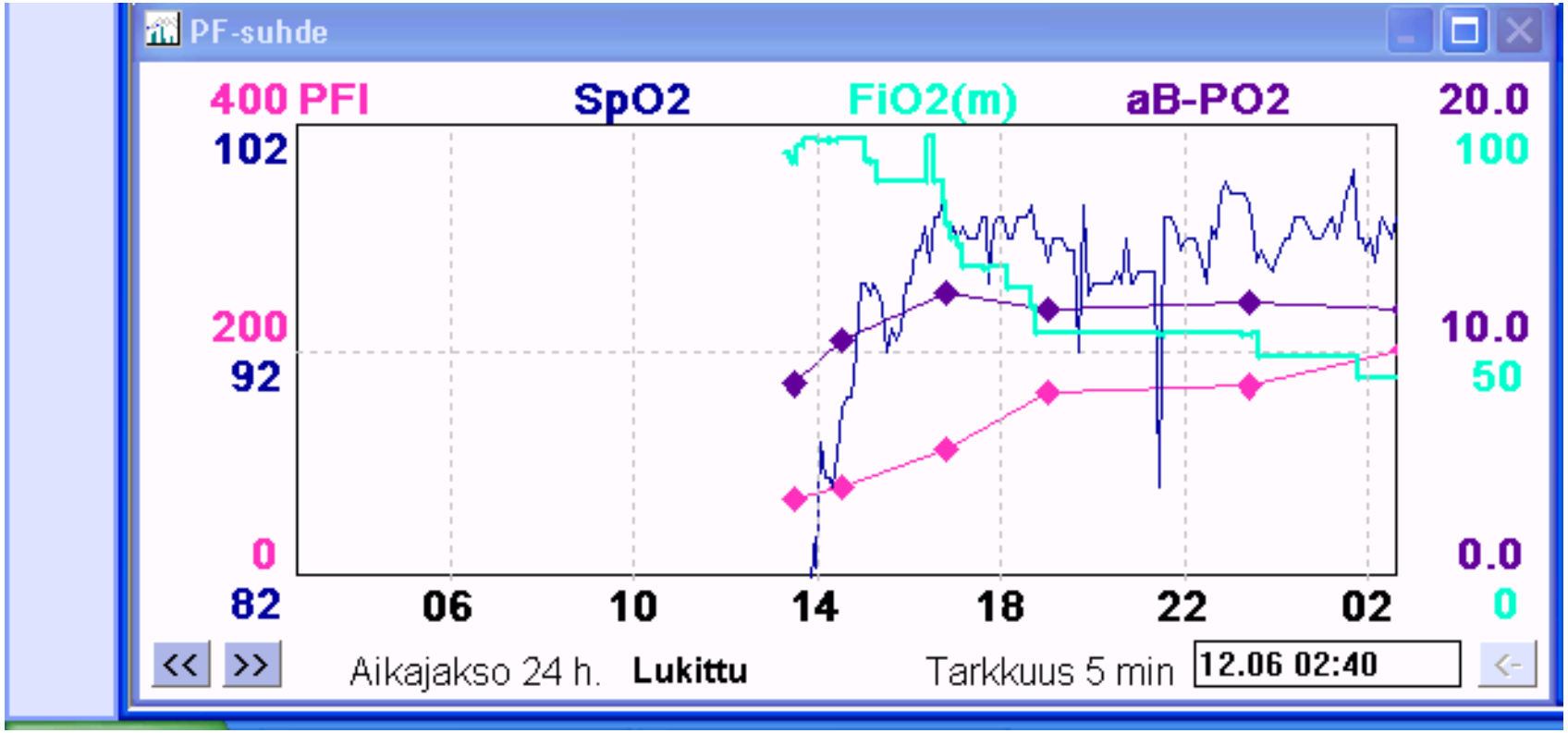
- SHOULD THIS PATIENT BE ADMITTED TO THE ICU?

- Quickly deteriorating condition
- aB-pH 7,11, BE -12,3 mmol/l, lactate 5,8 mmol/l
- Sudden collapse, respiratory arrest and cardiac arrest
- Primary rhythm PEA
- Resuscitation, 7 min to ROSC
- To the ICU, mechanical ventilation, vasoactive drug support etc.

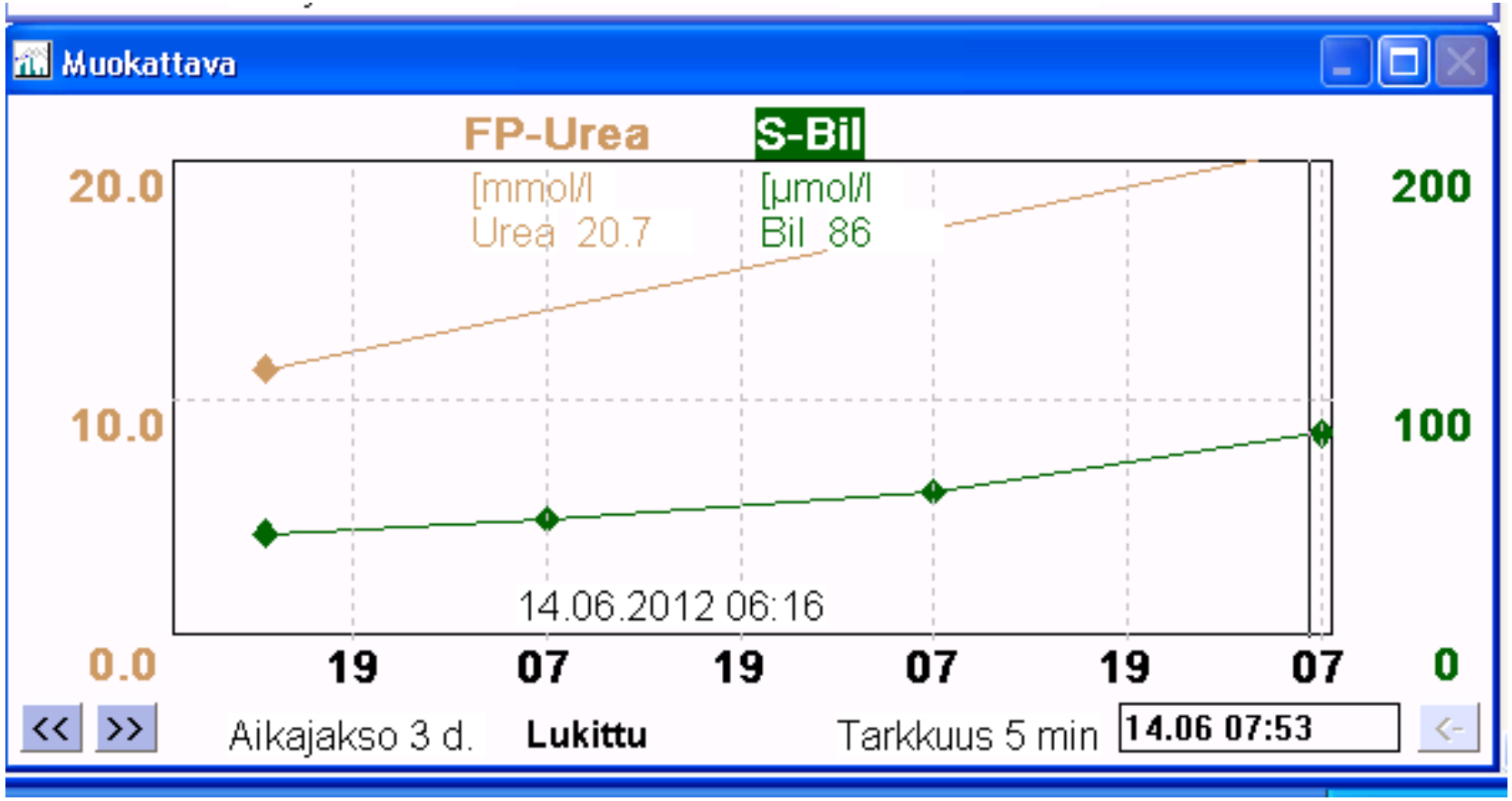
Severe circulatory failure



Severe oxygenation problem



Renal and hepatic problems



Cumulative urine output during first 24 hrs: 282 ml

In addition

- Worsening thrombocytopenia, ad 56 E9/l
- Poor level of consciousness

Prognosis?

✓Day 1 SOFA score: 19

- Is this a wrong patient in the ICU?

Outcome

- 13 days in the ICU, 24 more days in the hospital, good recovery
- Visited the ICU 2 months later in seemingly good health

Key to success?

- Good premorbid functional status
- **Definitive treatment of the underlying problem**
  - ERCP + stenting of the ductus choledochus, thus relieving the biliary obstruction

ESSENTIAL QUESTION: IS IT POSSIBLE TO TREAT THE UNDERLYING CAUSE FOR THE DANGER TO LIFE?

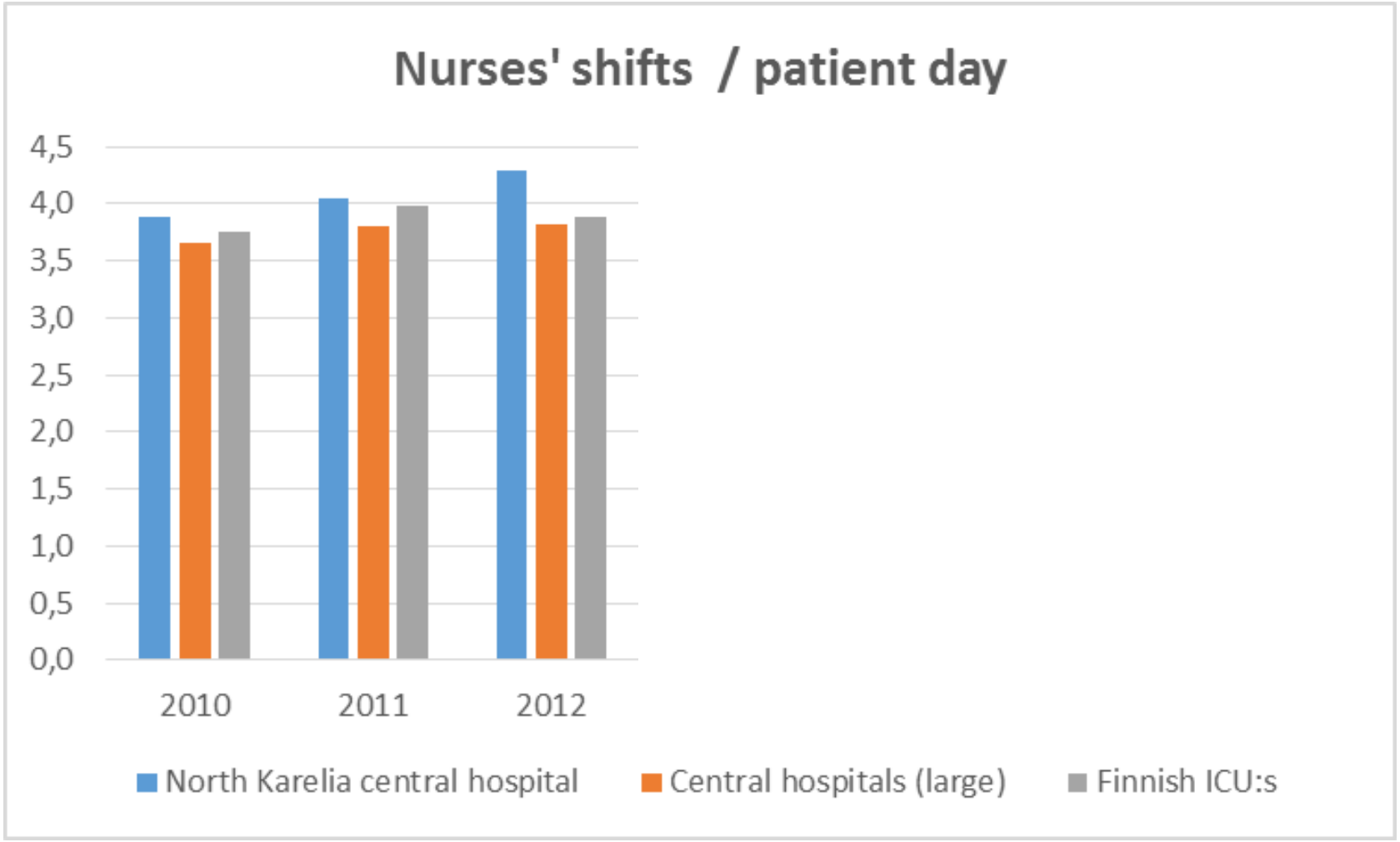
ADMISSION OF ”WRONG” OLD PATIENTS: IMPLICATIONS FOR BENCHMARKING?

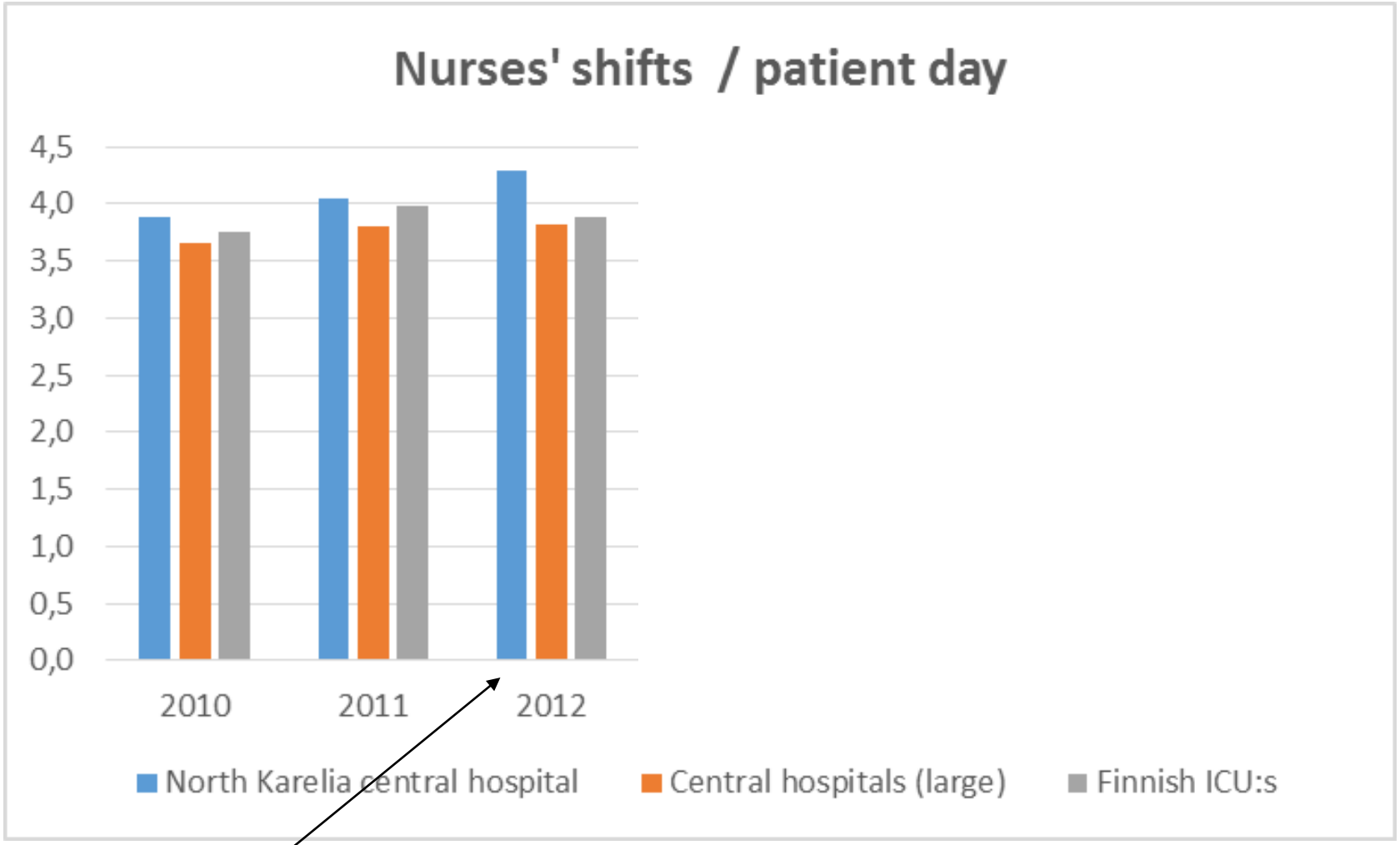
- ✓Not very much – it is difficult/impossible to name groups of patients that are definitely ”wrong” in the ICU
- ✓Old patients with e.g.
  - poor level of consciousness
  - cardiac arrest with a non-shockable primary rhythm
  - failure of multiple organ systems

  generally have a poor prognosis – but some do recover

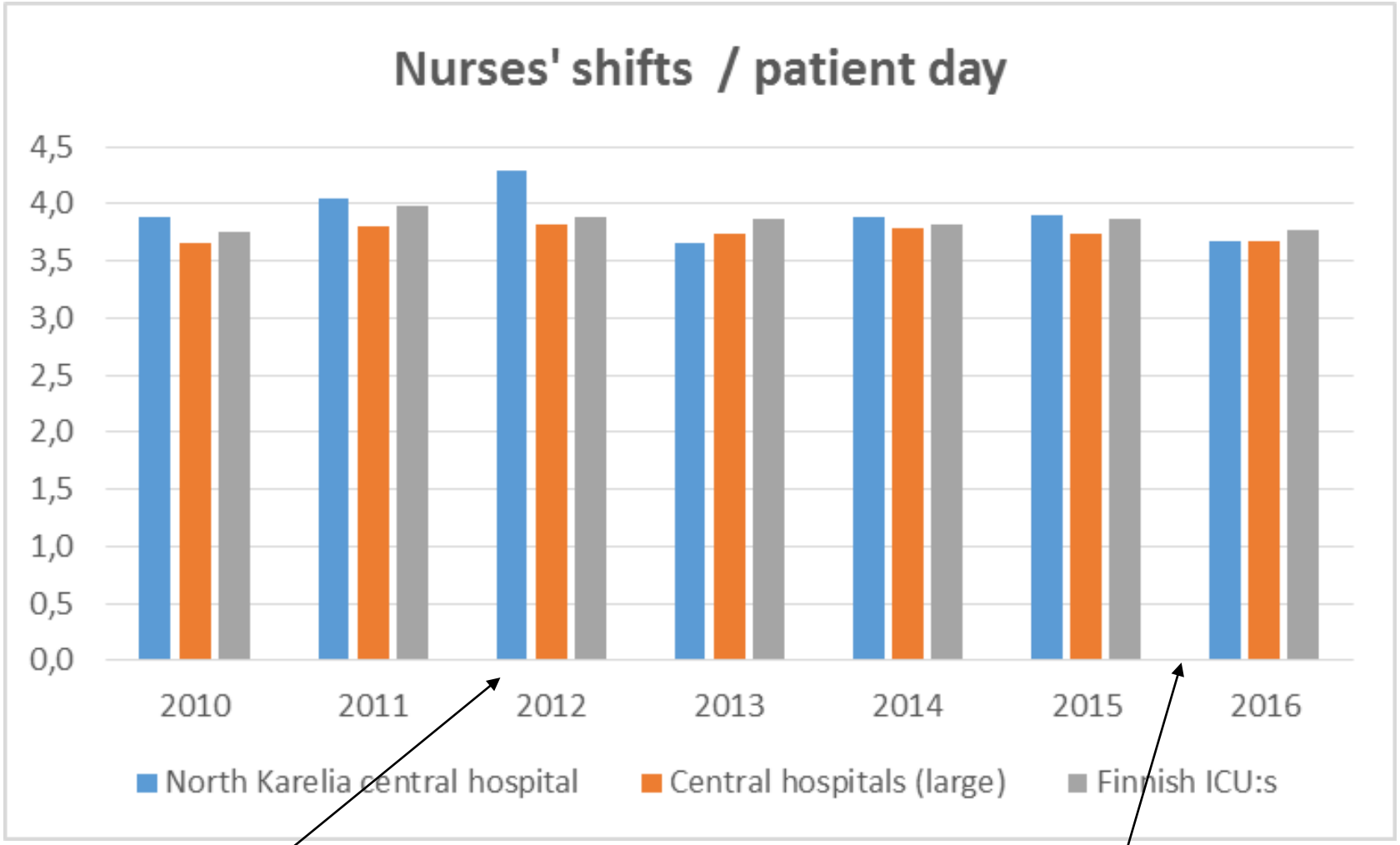
- ✓Even so, it may be interesting to compare admission policies

STRIVING FOR QUALITY IMPROVEMENT: RESOURCES USED


Nurses' shifts / patient day
4,5
4,0
3,5
3,0
2,5
2,0
1,5
1,0
0,5
0,0
2010
2011
2012
North Karelia central hospital
Central hospitals (large)
Finnish ICU:s



The same head nurse to lead the nursing staff in the ICU and PACU

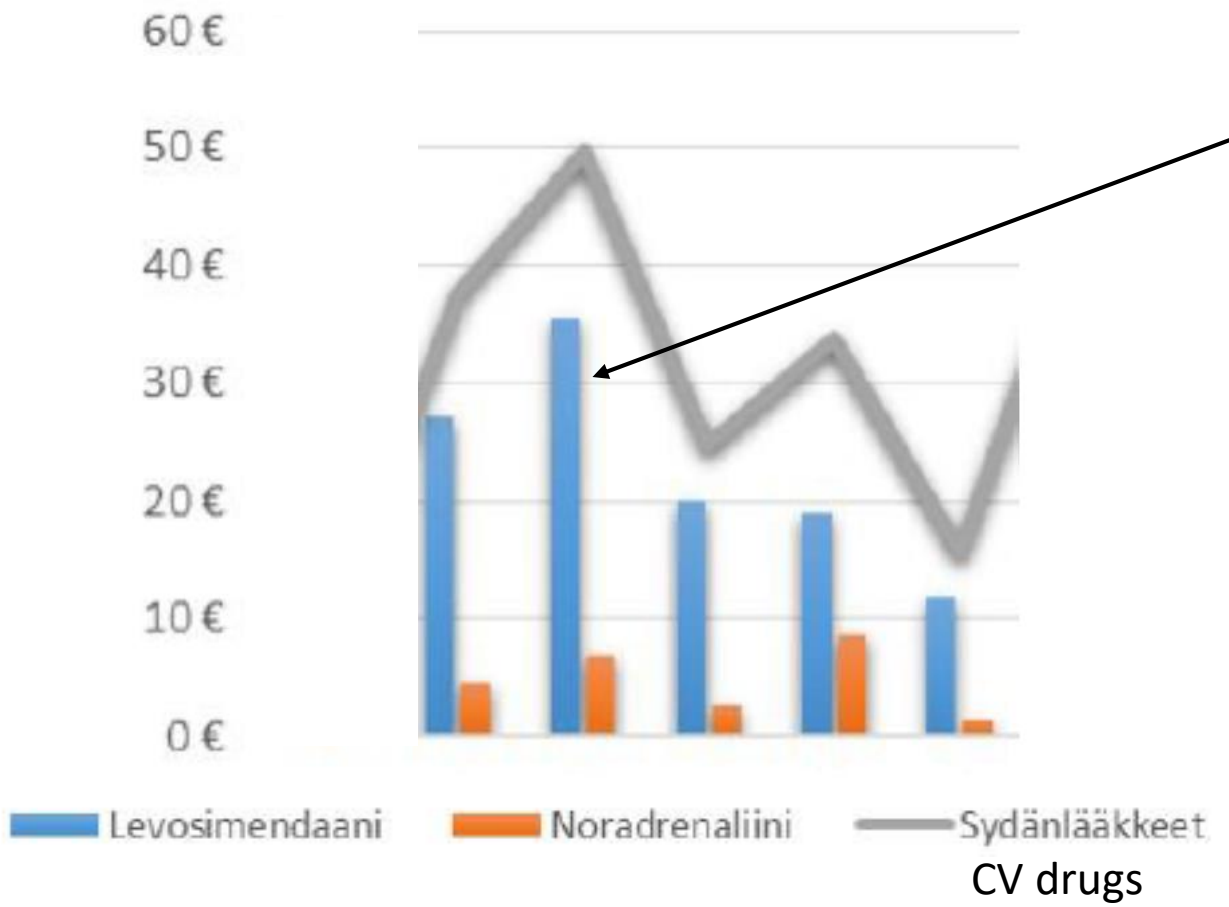


The same head nurse to lead the nursing staff in the ICU and PACU

One pool of nursing staff for ICU, IMCU and PACU, one head nurse

STRIVING FOR QUALITY IMPROVEMENT: RESOURCES USED

Levosimendan, noradrenaline and all cardiovascular drugs / treatment day



North Karelia Central Hospital ICU

PKKS / Teho-osasto, 2017/05 alk.

Simdaxin käyttöaiheiden seuranta

Pvm: _____ Klo: _____

❑ 1) Todettu alentunut sydämen pumppausfunktio **JA** a) hypoperfuusion merkkejä tai b) hengitysvajaukseen johtanut keuhkokongestio

Sydämen pumppausfunktion alenema todettiin
- ❑ ultraäänitutkimuksella
- ❑ keuhkovaltimokatetrilla
- ❑ valtimopainekäyrään perustuvalla mittauksella (Vigileo)
- ❑ muulla tavoin, miten? _____

JA

a) todettiin hypoperfuusion merkkeinä
- ❑ hyperlaktatemia
- ❑ metabolinen asidoosi
- ❑ oliguria / anuria
- ❑ matala SvO_2 / $ScvO_2$
- ❑ laikukas, marmoroitunut ihon väri
- ❑ muita merkkejä, mitä?

tai

❑ b) todettiin hengitysvajaukseen johtanut keuhkokongestio

❑ 2) Muu syy, mikä?

Monitoring of indications for Simdax

1) Evidence of poor cardiac function **AND**
a) signs of hypoperfusion or b) pulmonary congestion

Poor cardiac function was detected by
- ❑ Echo
- ❑ Pulmonary artery catheter
- ❑ Pulse wave-based measurement
- ❑ In some other way, how?

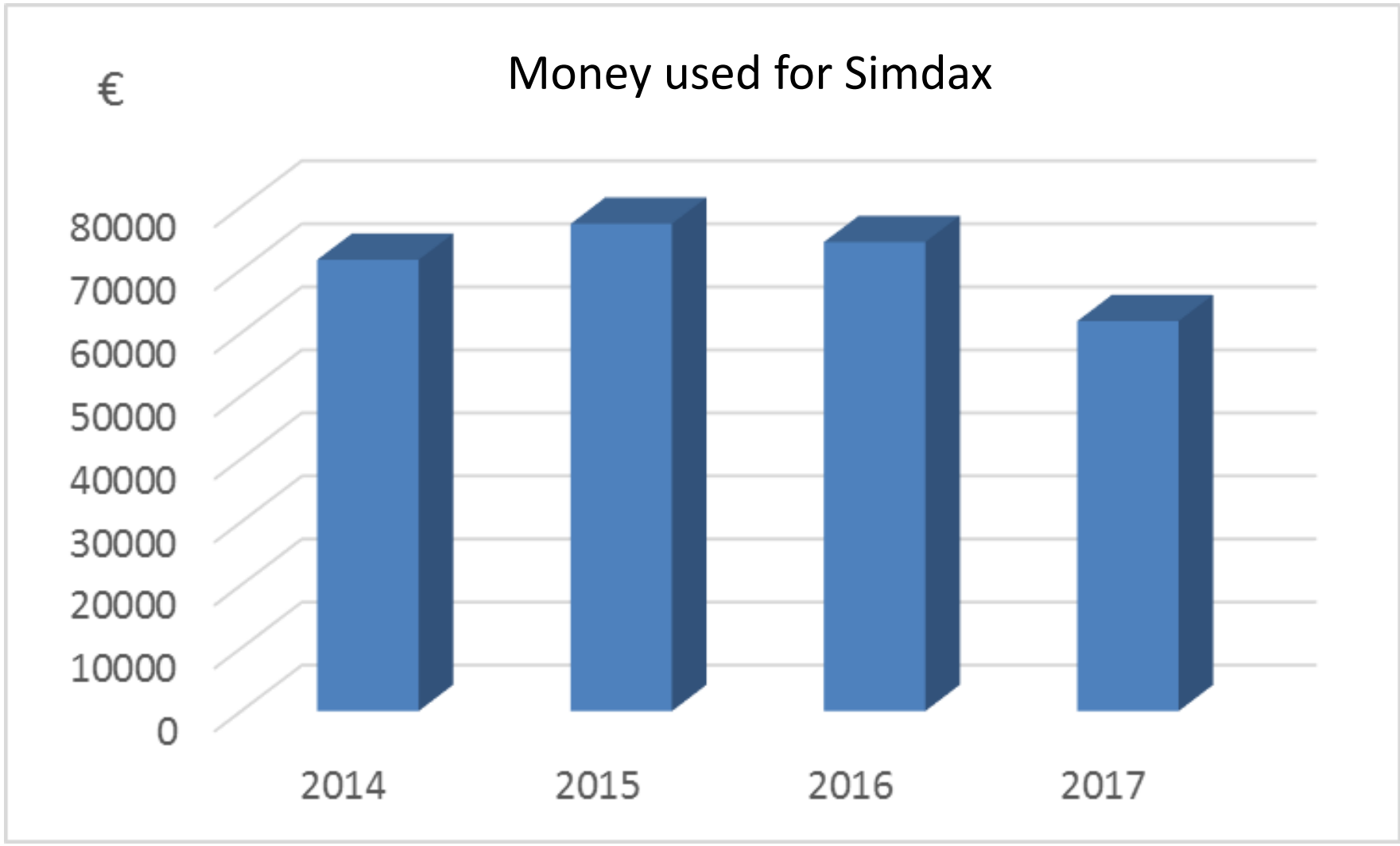
AND

a) signs of hypoperfusion
- ❑ Hyperlactatemia
- ❑ Metabolic acidosis
- ❑ Oliguria/anuria
- ❑ Mottling of skin
- ❑ Other signs, specify

OR

b)
- ❑ Pulmonary congestion and respiratory insufficiency

2) Another reason, please specify


Money used for Simdax
€
80000
70000
60000
50000
40000
30000
20000
10000
0
2014
2015
2016
2017

SUMMARY

- Show interest in the performance statistics of your unit

SUMMARY

- Are there signals suggesting reasons for actions?
- However, if the report claims that your performance statistics are good/poor, don’t get too excited/anxious
- Get familiar with the factors affecting performance calculations

SUMMARY

- Dig deeper: try to find the factors that explain differences between units
- What is it that your comparator is doing differently?

- Are there differences in documentation?
- Do you admit too many patients with hopeless prognosis?
- Do you discharge the patients too early?
- Do you have problems with post-ICU care?
- Do you have problems with pre-ICU care?
- Do you have problems with certain patient groups?
- Do you have too few / too many staff?
- Do you spend more money than others do on blood products or drugs etc.?

- Sometimes, the data may tell you that you are doing well. That’s a good reason for being happy, but beware of becoming self-satisfied!