

Practical tools for optimizing bed allocation in hospitals

PLEXUS[®]

Datum: 14 januari 2010

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Plexus

- **Consulting firm with its primary focus on health care.**
- **Our passion is to optimize patient safety and contribute to high quality and efficiency in the health sector.**
- **By combining analytical expertise with medical and managerial knowledge we help our clients to realize their goals.**
- **Dutch market leader in health care advisory services for more than 15 years.**



Agenda

- **Background of clinical beds in a hospital**
- **Why is bed allocation an issue?**
- **What do you see in practice?**
- **How to optimize bed occupancy**
- **Practical tools to help hospitals to address this issue**



Background

- **Total number of beds varies from 200 – 500 per hospital.**
- **Mostly the wards are divided by specialty.**
- **Managerial they are clustered: Surgical wards, Internal wards and Women and Child care.**
- **Clinical care is divided by: daycare, short-stay and long-stay.**
- **Average length of stay 4-5 days (short stay 2 days).**
- **Planned and unplanned patients (emergency) are mostly mixed.**



Why is bed allocation an issue?

Strategic

- Bed distribution is often derived from former privileges
- The hospital bears the costs, not the specialties
- Integrated management is often lacking

Tactical

- Management information is often insufficient
 - Data is production-driven: # of admissions, and total # of bed days
 - No insight in (daily) usage of beds

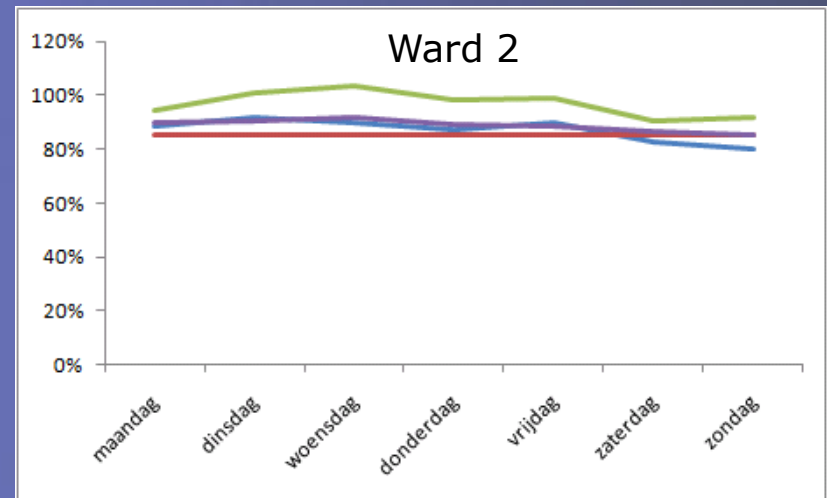
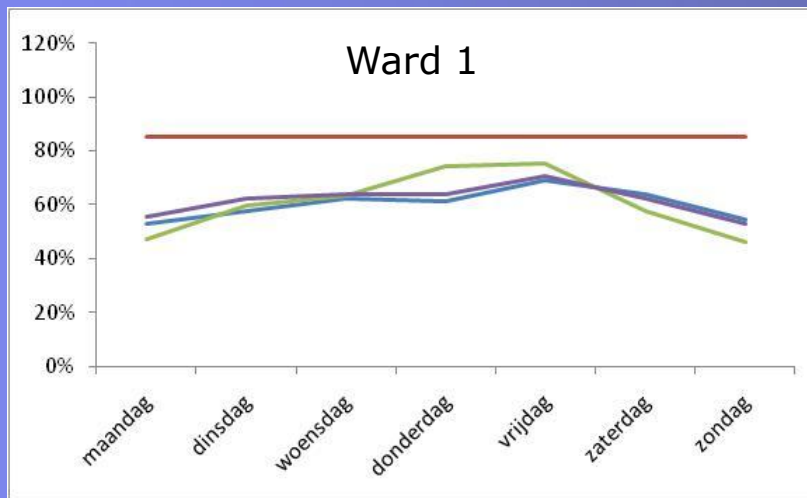
Operational

- No single person responsible for the allocation of beds on a daily basis
- Lack of rules with regard to priority of patients (emergency, planned surgery, ..)



What do you see in practice?

- Uneven distribution of bed occupancy:
 - Wards with low bed occupancy
 - Wards with very high bed occupancy
- Fluctuations in bed occupancy throughout the week



— 2009 — 2008 — 2007 — Target



What do you see in practice?

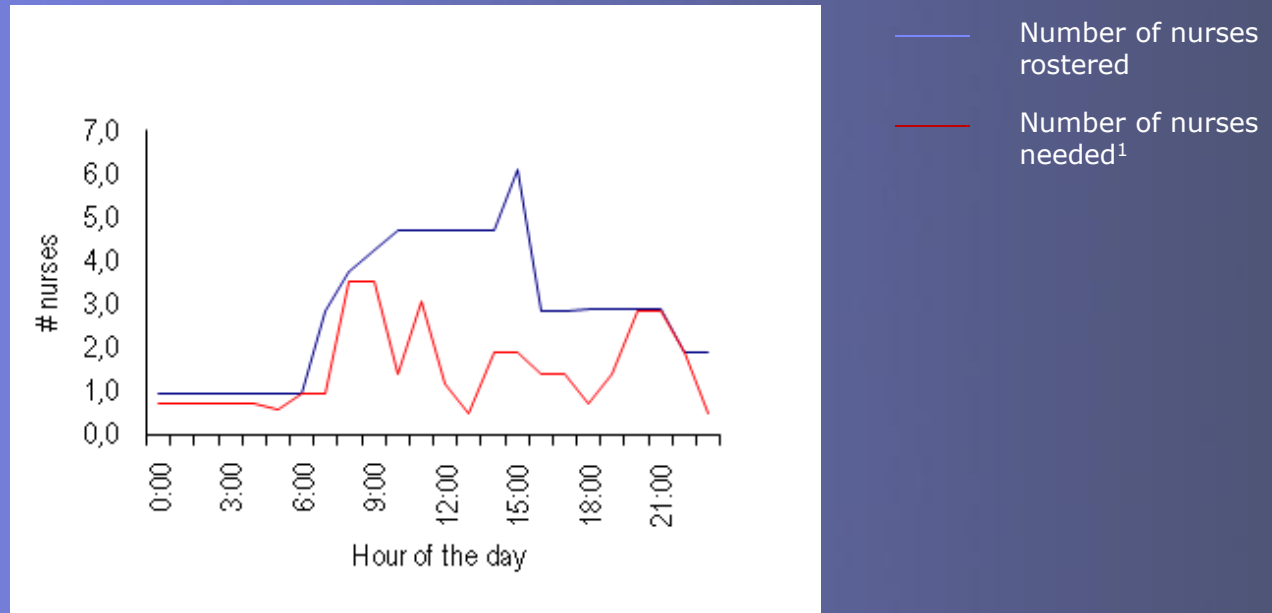
Patients staying at the 'wrong' ward

% of patients on the surgical ward	Cardiology	3%
	Surgery	87%
	Internal medicine	2%
	Pulmonary disease	5%
	Neurology	2%
	Other	1%



What do you see in practice?

- Fixed staffing rosters, that do not track daily care demand

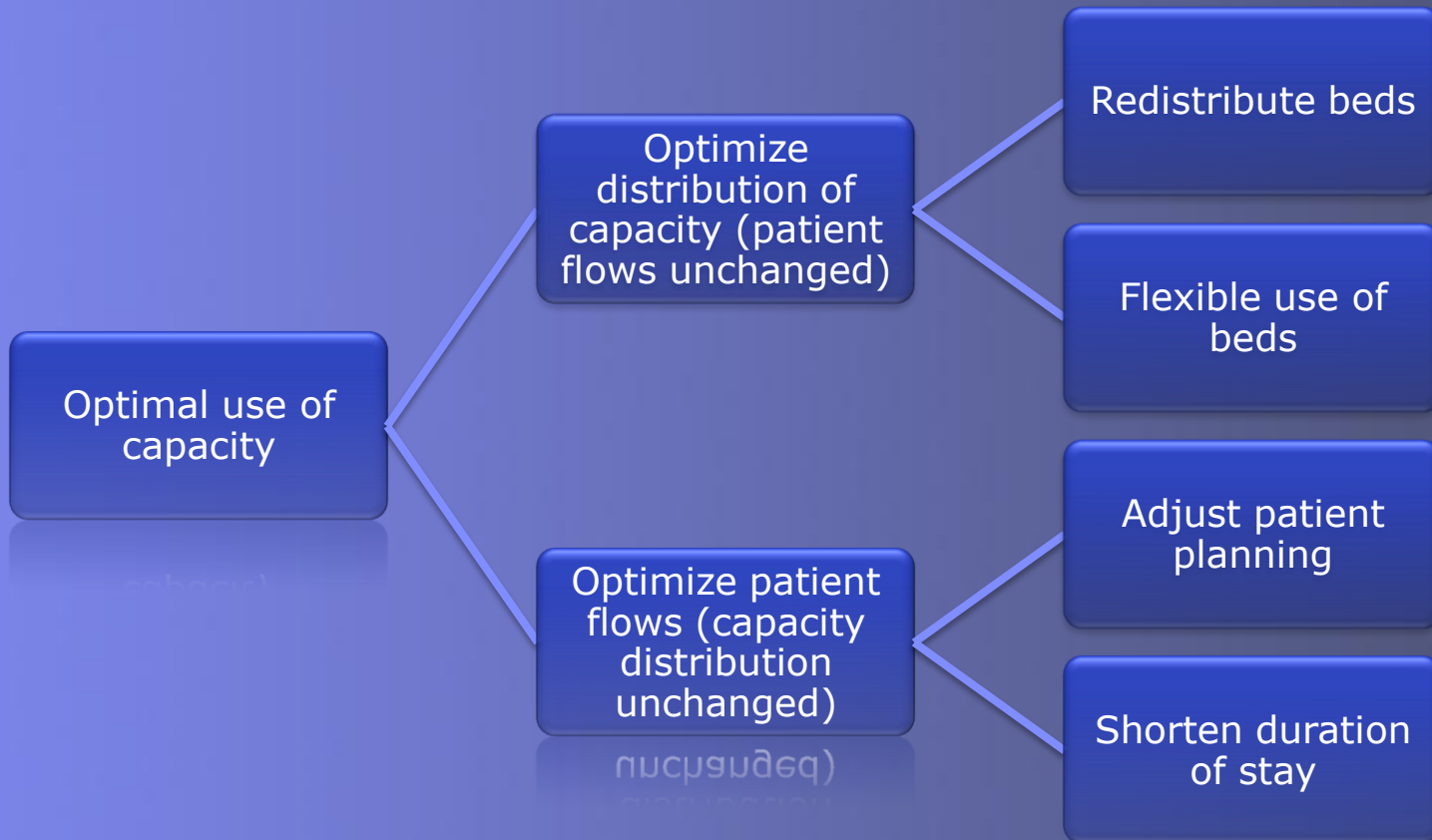


- Inefficiencies due to scale

¹ The number of nurses needed is estimated by listing the activities at each hour of the day



How to optimize bed occupancy



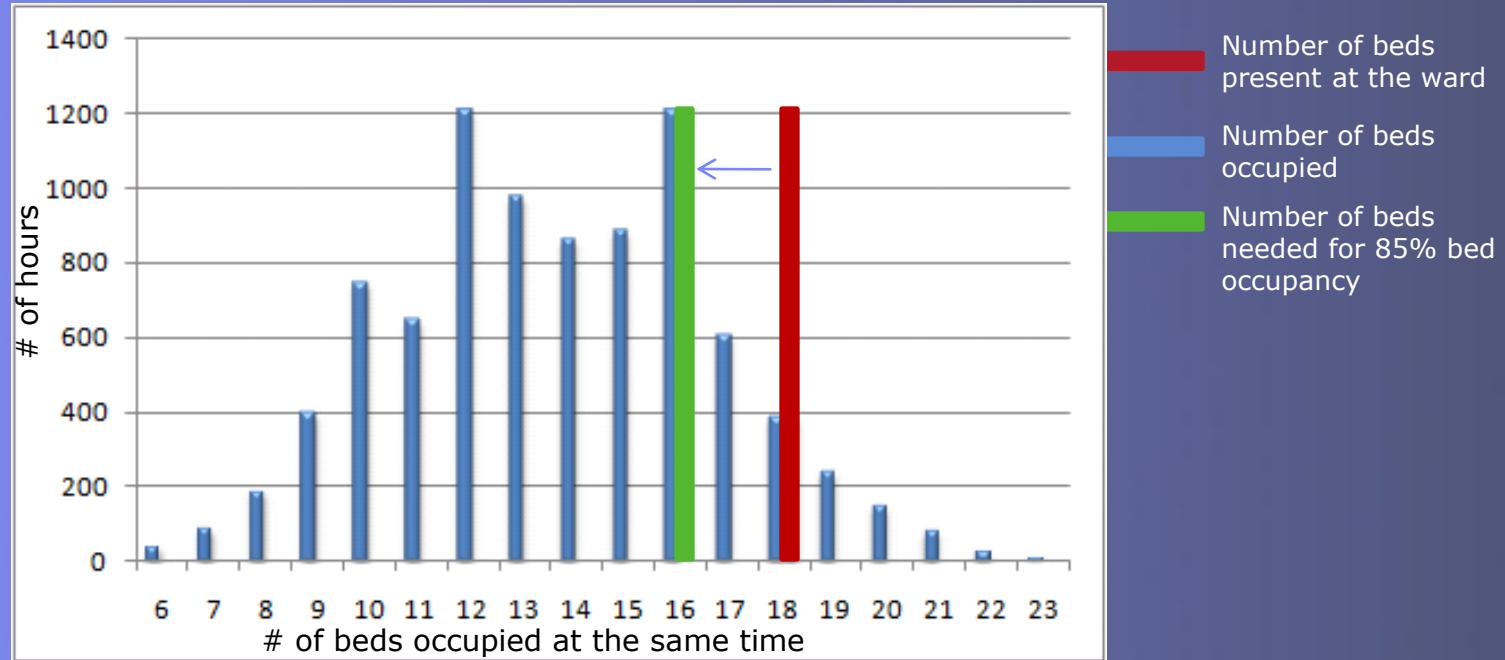
Practical tools to address this issue

It starts with giving insight in patient flows



How many beds are occupied at the same time? – example 1

In this example we see excess capacity; 30% of bed hours is unused

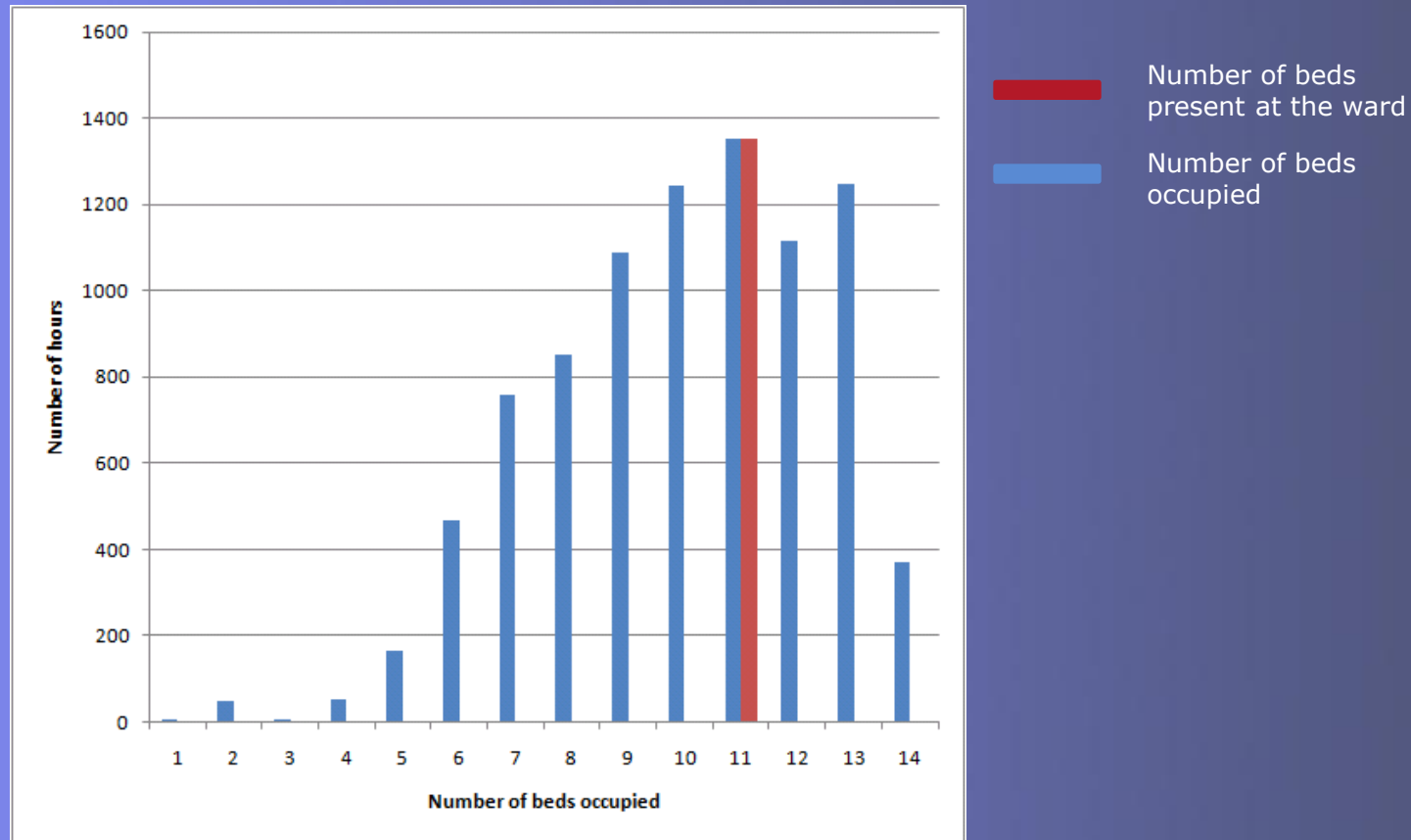


For each hour during the day shift we calculate the number of patients, belonging to a specific ward, that are present at the same time, based on historical patient data.



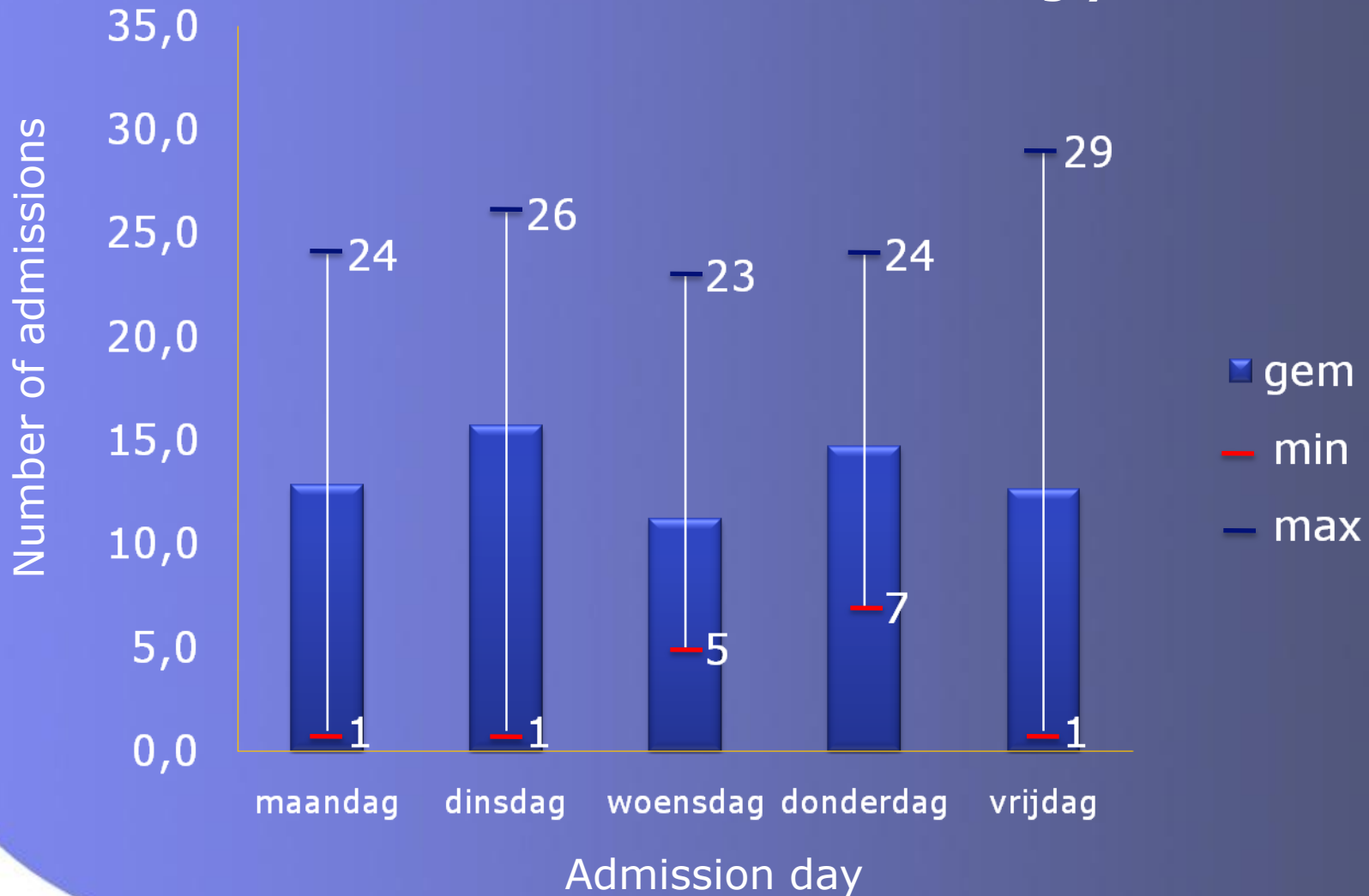
How many beds are occupied at the same time? – example 2

In 30% of the time the number of beds present are insufficient



Variation in number of admissions a day (daycare)

it is hard to roster nurses accordingly



How to use this insight in practice

Question from hospital A

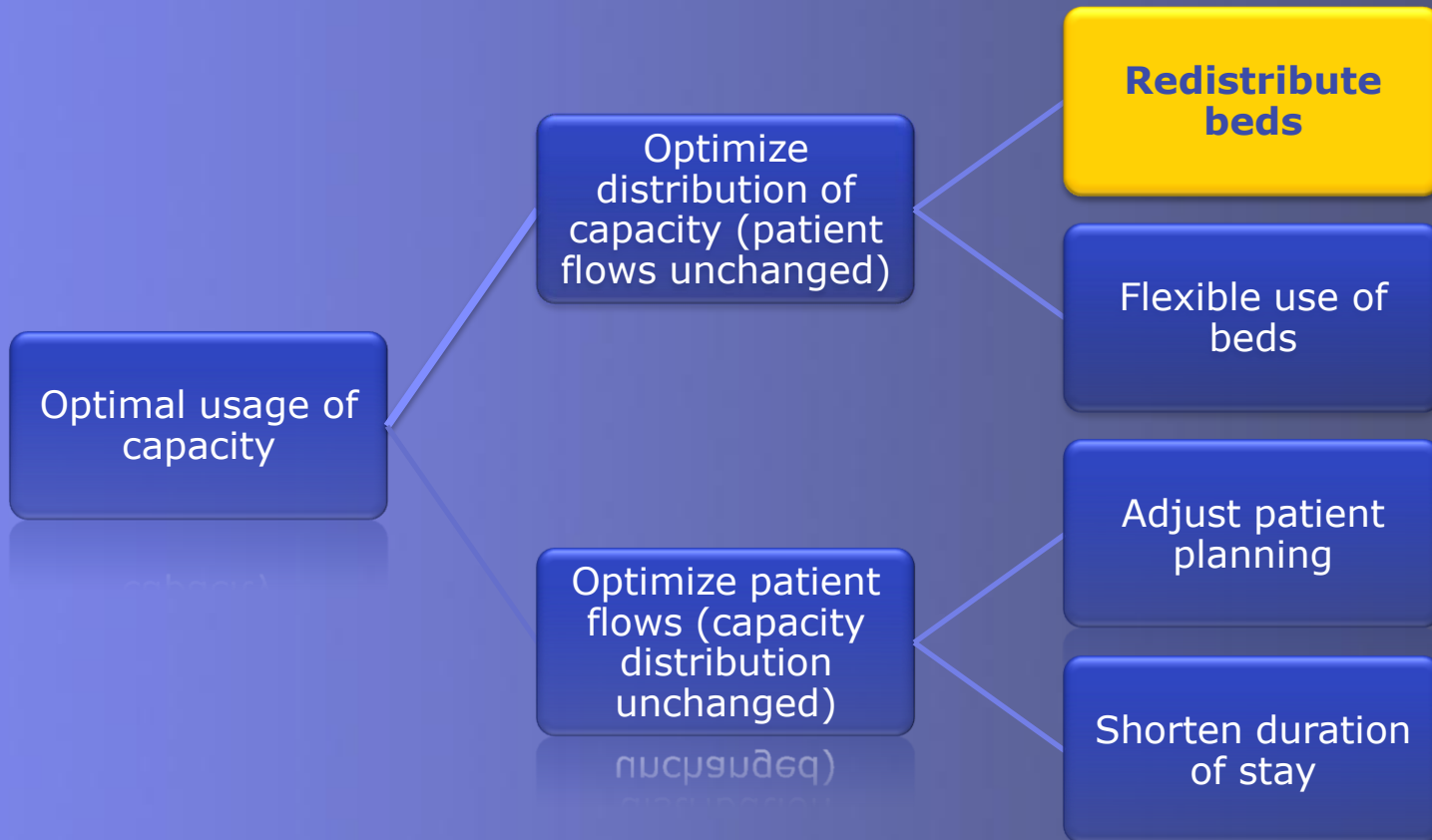
- **We want to increase production, without increasing the capacity**
- **But, bed availability is a bottle neck**
- **A lot of patient are staying at 'the wrong ward'**

Question:

Can you help us to find a better fit for the distribution of beds based on the number of patients per specialty



How to use this insight in practice



Redistribution of beds, calculated by historical data; total # of beds fixed

1. Patients assigned to the right ward

2. Calculation of the number of beds used per hour per day

3. Number of beds needed calculated for weekdays – dayshift by:

- Average + X * variation (S.D.), X being a 'redistribution' factor

4. Calculation of the 'redistribution' factor X , based on a fixed number of beds

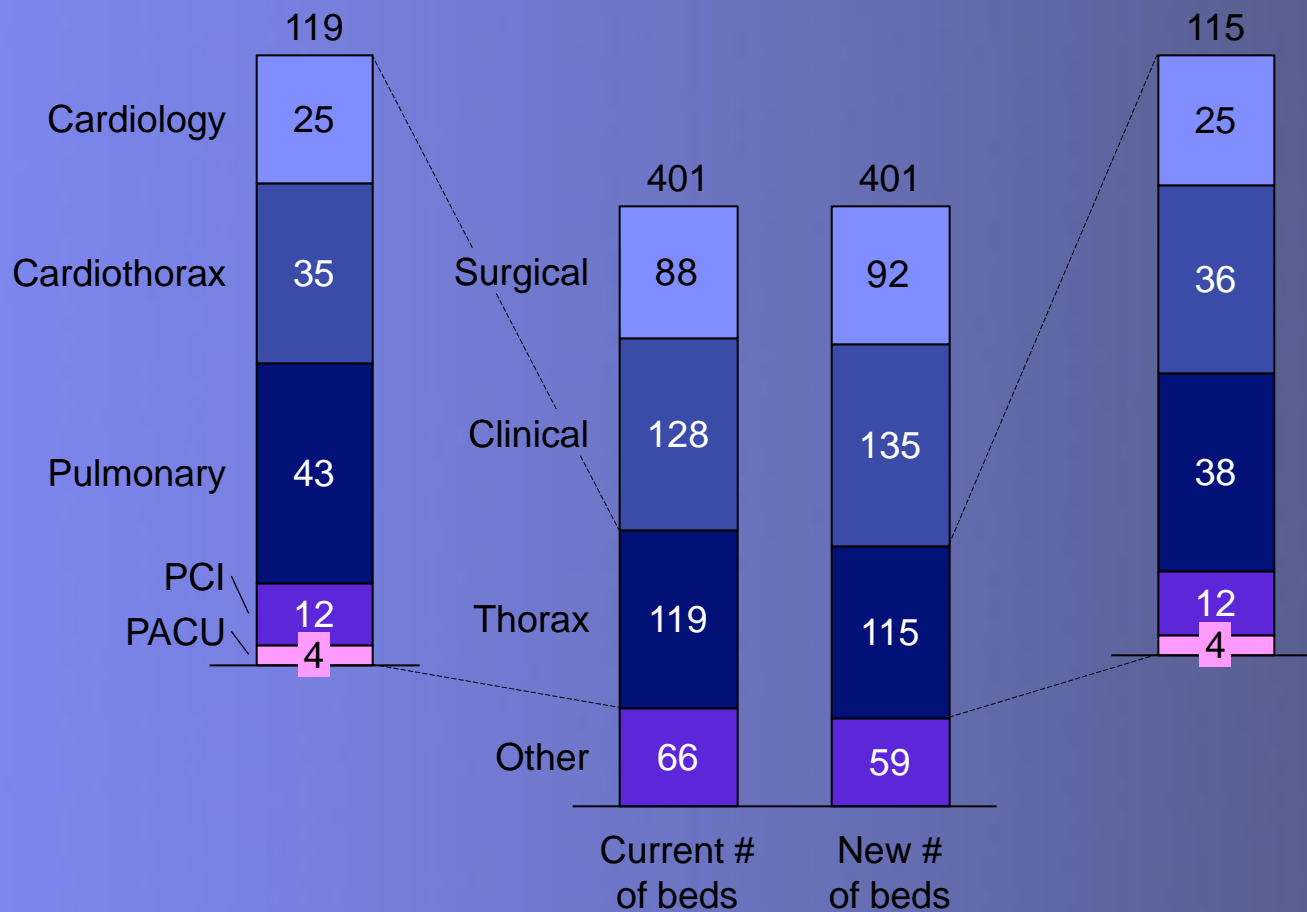
$$\sum_i (\text{Average}_i \# + X * \text{S.D.}_i) = \text{total nr of beds}$$

5. Redistribution of beds

Ward	Average # of beds	St dev	1	Number of beds needed	# of beds newly assigned	Current # of beds	Difference
Surgical ward	38,66	5,50		44,16	45	40	5
Pulmonary ward	32,36	6		38,26	38	41+2	-5



Redistribution of beds, with a fixed total number of beds



How to use this insight in practice

Question from hospital B

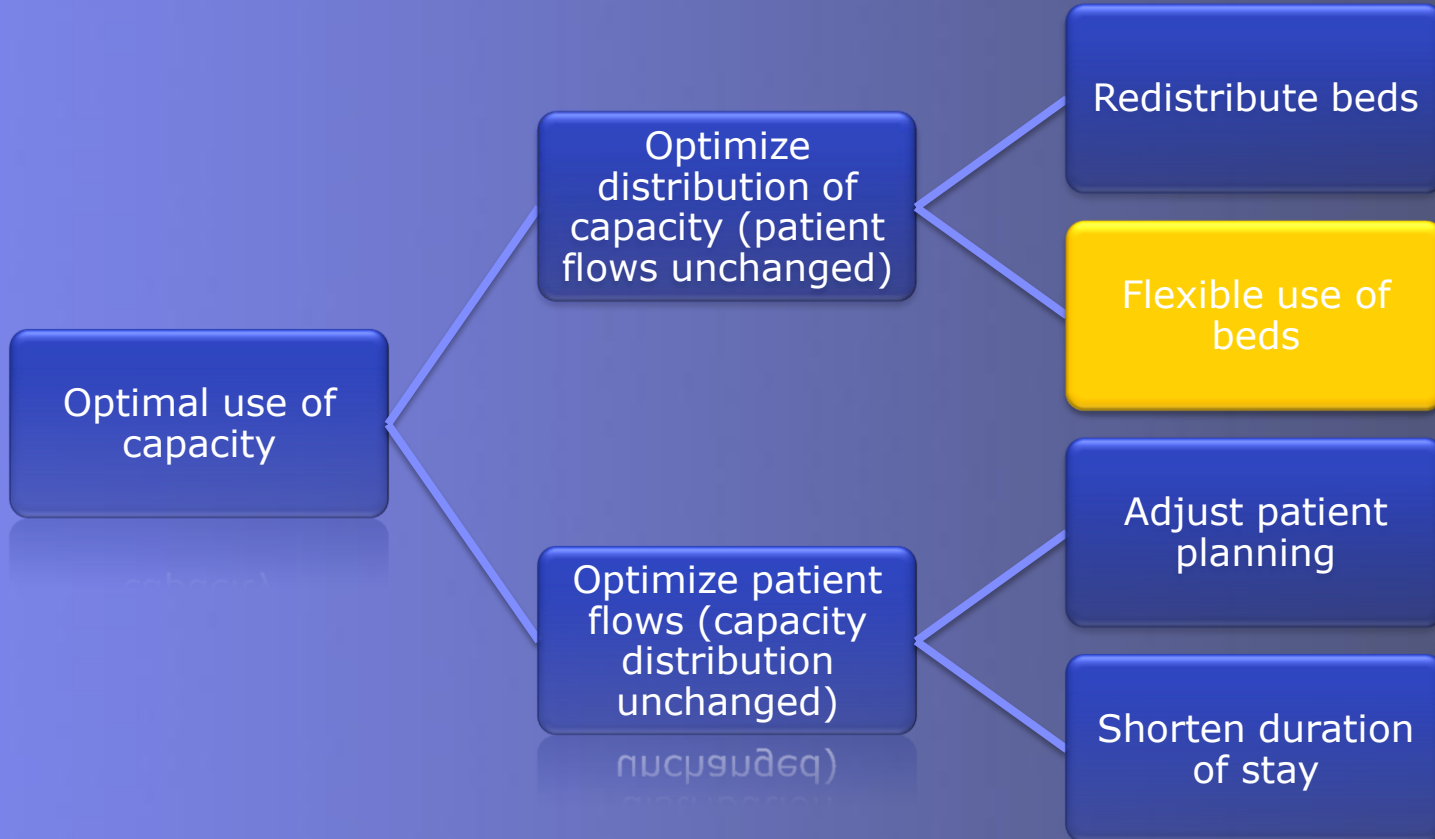
- **We want to save costs**
- **We deal with large fluctuations in bed occupancy; average occupancy is low**
- **Wards are relatively small**

Question:

Can you help us to obtain higher bed occupancies, and lower costs for personnel.



How to use this insight in practice



Flexible use of beds

Definition



Warm beds,
assigned to a
specific specialty

Calculation

Minimum # of beds
used by specialty
(on average during
a day-shift)¹



Lukewarm beds,
shared by different of
specialties
(harmonica)

of beds needed to
fit 90% of all
patienthours



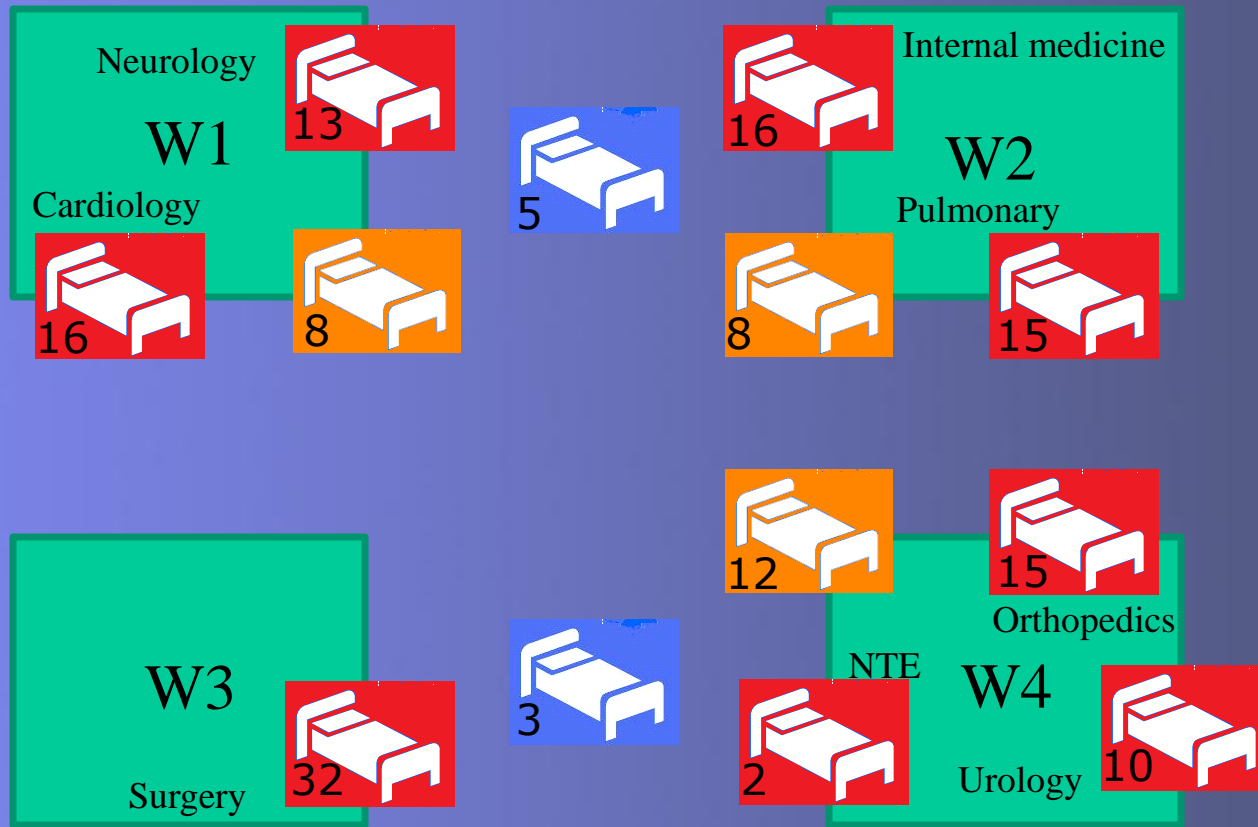
Cold beds, only
used when
necessary

of beds needed to
fit 95% of all
patienthours

¹for each weekday in a year period we calculated the minimum number of beds occupied at the same time; we took the average of this minimum



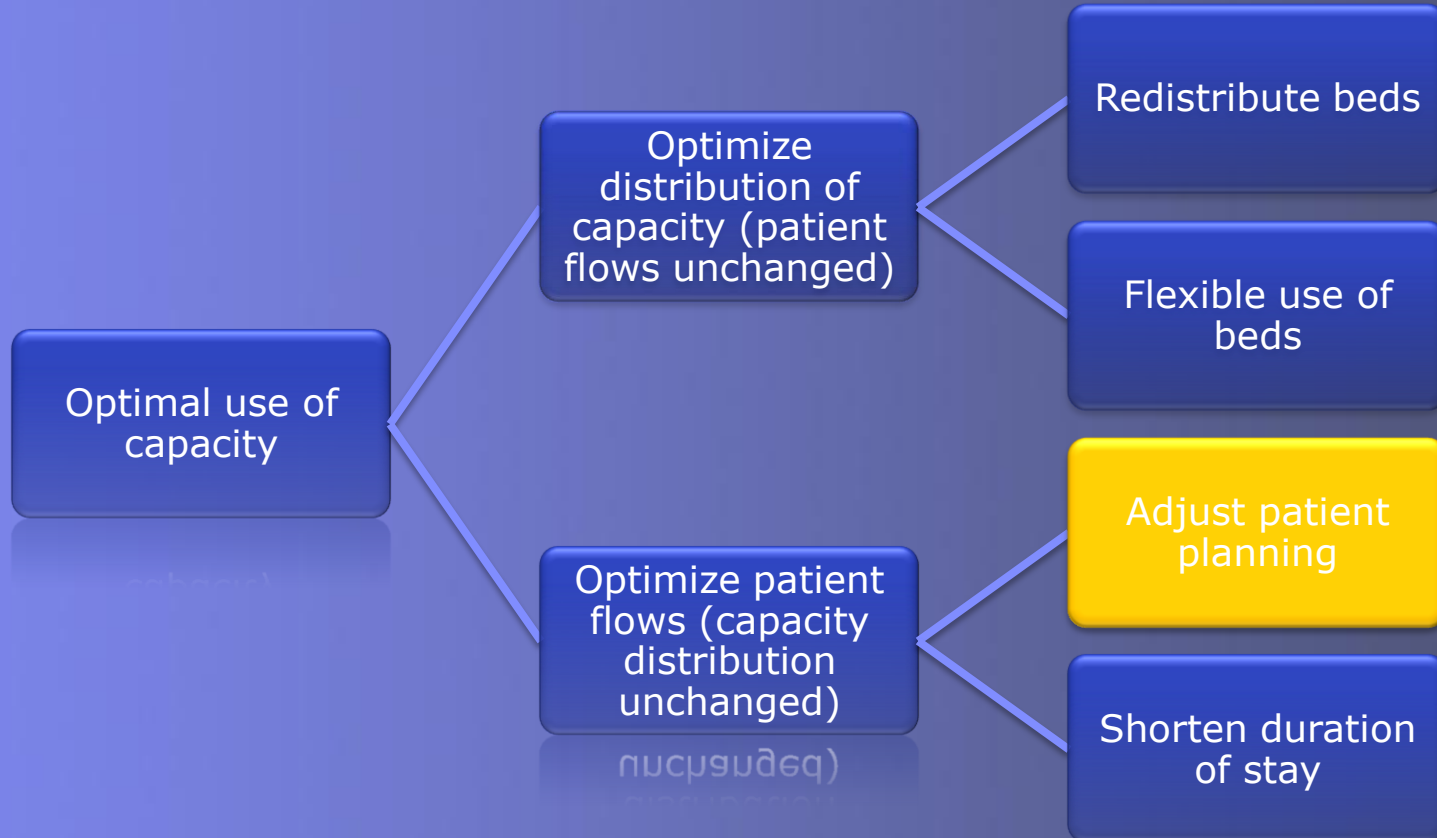
Flexible use of beds: a minimum number of beds is assigned, the rest is flexible



Total number of beds = **188** vs **205** needed with the traditional distribution



How to use this insight in practice



Adjust patient planning, accounting for the number of beds available

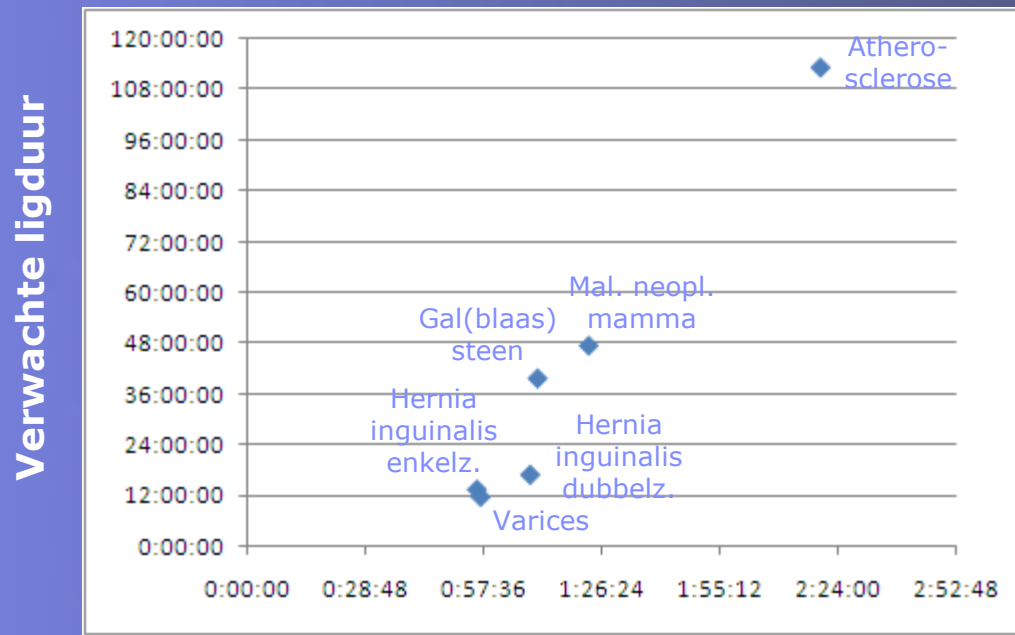
Surgical ward	mon	tues	wed	thur	fri
total number of beds available	34	34	34	34	34
Bed occupancy 85%	29	29	29	29	29
Number of beds used					
Not planned	13	13	13	13	12
Planned	10	11	12	15	14
Total number of beds used	23	24	25	27	27
Number of beds available for patient planning					
Total number of beds available for patient planning	16	15	16	16	17

- Unplanned admissions are fairly stable.
- In this example 13 beds have to be reserved for unplanned patients.
- This leaves 16 beds available for patient planning.



Patiënt planning – matching OR, ICU, wards

Find the best fit between waiting lists, roster for the OR, time needed for the intervention, expected length of stay



OK snijtijd

	Ma	Di	Wo	Do	Vr	Za	Zo
# bedden klinisch	5	8	3	6	2	2	2
# liguren cumulatief	60	70					
# bedden dag	48	48	48	48	48	0	0
# liguren cumulatief	384	384					



Concluding

- **Optimizing capacity use at clinical wards asks for redistribution of (bed) capacity as well as better patient and discharge planning**
- **Redistributing beds only pays if staffing is adapted as well: e.g. one spare bed does not pay**
- **Giving insight is a first step to change, but don't lose the hospital management and the specialists on your way**
- **80/20 rule ; given the quality of data you can question the added value of more advanced statistics**

Keep it simple!!



