

Variation of patient turnover on a 30-minutes basis for 3 years: analysis of routine data of a Swiss University Hospital

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UseR! Toulouse, 10.07.2019



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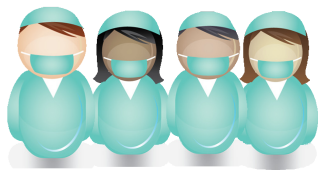
Pflegewissenschaft
Nursing Science

 **INSELGRUPPE**

Bern University Hospital
Direktion Pflege/MTT
Nursing Research Unit

Background

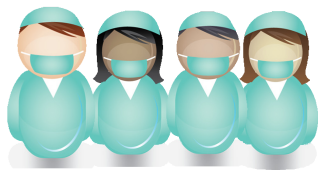
Nurses



~80%



Nurses staffing and patients



Nurses staffing and patients



**AGGREGATED
DATA**

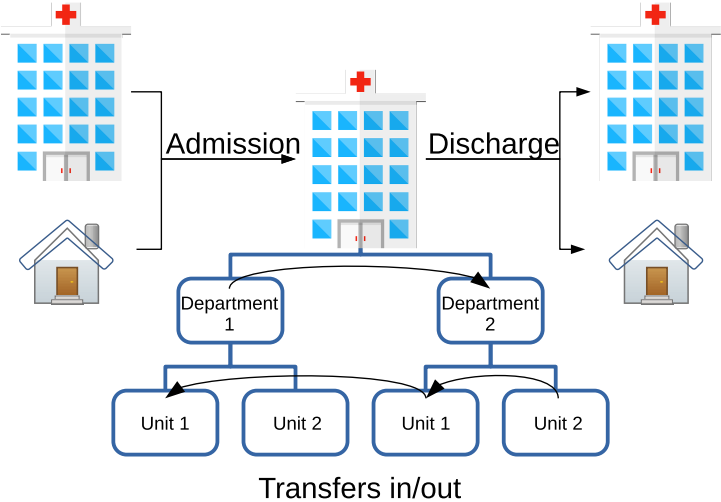


Data, Methods & Results

Overview

- Part of a detailed descriptive analysis of University Hospital in Switzerland
 - 30-minutes interval → 52 millions observations
 - Two data merged
 - 70 units from 10 departments
 - 4,633 nurses & 128,484 patients
- Number of nurses and patients
- Number of patient turnover
 - Increase workload
 - Administrative tasks
 - Patient care needs
 - Additional patients
 - Patient-to-nurse ratio constant → movement of patients can happen

Patient turnover



Patient turnover

Date	Time	Department	Unit
2015-06-26	19:15	Intensive care	Intens 1
2015-06-26	22:00	Orthopaedics & Plastic Surgery	Orthop 1
2015-06-30	19:30	Intensive care	Intens 2
2015-07-01	19:05	Intensive care	Intens 3
2015-07-03	13:25	Intensive care	Intens 2
2015-07-04	20:00	Orthopaedics & Plastic Surgery	Orthop 1
2015-07-08	14:00	Internal Medicine	Intern 1
2015-07-08	14:12	Internal Medicine	Intern 1
2015-07-09	13:10	Internal Medicine	Intern 1
2015-07-10	14:38	Internal Medicine	Intern 1
2015-07-17	16:41	Internal Medicine	Intern 1
2015-07-18	17:25	Intensive care	Intens 2
2015-07-20	03:40	Intensive care	Intens 4
2015-07-21	13:50	Intensive care	Intens 2
2015-07-23	15:20	Intensive care	Intens 2

Patient turnover

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Transfers for Intern 1

Date	Time	Department	Unit	Move
2015-06-26	19:15	Intensive care	Intens 1	NotAdmission
2015-06-26	22:00	Orthopaedics and Plastic Surgery	Orthop 1	TransferOut
2015-06-30	19:30	Intensive care	Intens 2	TransferOut
2015-07-01	19:05	Intensive care	Intens 3	TransferOut
2015-07-03	13:25	Intensive care	Intens 2	TransferOut
2015-07-04	20:00	Orthopaedics and Plastic Surgery	Orthop 1	TransferOut
2015-07-08	14:00	Internal Medicine	Intern 1	TransferIn
2015-07-08	14:12	Internal Medicine	Intern 1	TransferIn
2015-07-09	13:10	Internal Medicine	Intern 1	TransferIn
2015-07-10	14:38	Internal Medicine	Intern 1	TransferIn
2015-07-17	16:41	Internal Medicine	Intern 1	TransferIn
2015-07-18	17:25	Intensive care	Intens 2	TransferOut
2015-07-20	03:40	Intensive care	Intens 4	TransferOut
2015-07-21	13:50	Intensive care	Intens 2	TransferOut
2015-07-23	15:20	Intensive care	Intens 2	NotDischarge

Add two variables

```
# Package
library(dplyr)

# Look at before/after each transfer
patient01 <- patient01 %>%
  mutate(next.Tr = lead(Move),
         before.Tr = lag(Move))
```

Date	Time	Unit	Move	next.Tr	before.Tr
2015-06-26	19:15	Intens 1	NotAdmission	TransferOut	NA
2015-06-26	22:00	Orthop 1	TransferOut	TransferOut	NotAdmission
2015-06-30	19:30	Intens 2	TransferOut	TransferOut	TransferOut
2015-07-01	19:05	Intens 3	TransferOut	TransferOut	TransferOut
2015-07-03	13:25	Intens 2	TransferOut	TransferOut	TransferOut
2015-07-04	20:00	Orthop 1	TransferOut	TransferIn	TransferOut
2015-07-08	14:00	Intern 1	TransferIn	TransferIn	TransferOut
2015-07-08	14:12	Intern 1	TransferIn	TransferIn	TransferIn

Select transfers for Intern 1

```
# Package
library(dplyr)

# Transfer in
patient01 <- patient01 %>%
  mutate(
    TransferIn = case_when(
      Move %in% "TransferIn" &
      before.Tr %ni% c("TransferIn", "Admission") ~ 1,
      TRUE ~ 0),
    TransferOut = case_when(
      Move %in% "TransferOut" &
      before.Tr %in% c("TransferIn", "Admission") ~ 1,
      TRUE ~ 0)
  )
```

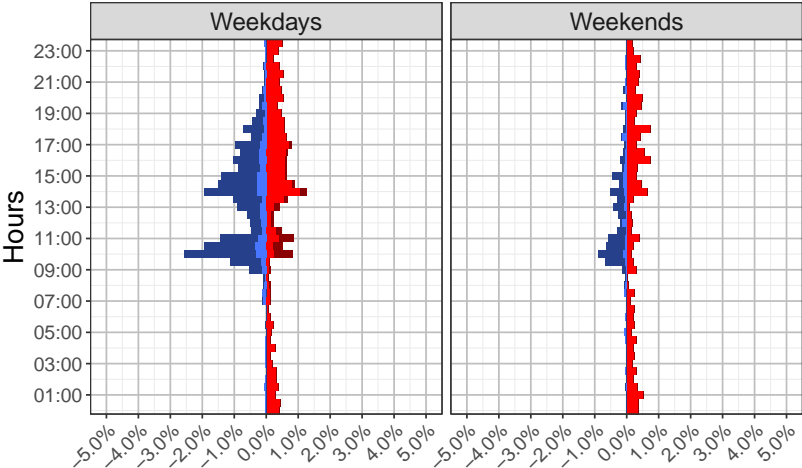
Select transfers for Intern 1

Date	Time	Unit	TransferIn	TransferOut
2015-06-26	19:15	Intens 1	0	0
2015-06-26	22:00	Orthop 1	0	0
2015-06-30	19:30	Intens 2	0	0
2015-07-01	19:05	Intens 3	0	0
2015-07-03	13:25	Intens 2	0	0
2015-07-04	20:00	Orthop 1	0	0
2015-07-08	14:00	Intern 1	1	0
2015-07-08	14:12	Intern 1	0	0
2015-07-09	13:10	Intern 1	0	0
2015-07-10	14:38	Intern 1	0	0
2015-07-17	16:41	Intern 1	0	0
2015-07-18	17:25	Intens 2	0	1
2015-07-20	03:40	Intens 4	0	0
2015-07-21	13:50	Intens 2	0	0
2015-07-23	15:20	Intens 2	0	0

Select transfers for Intern 1

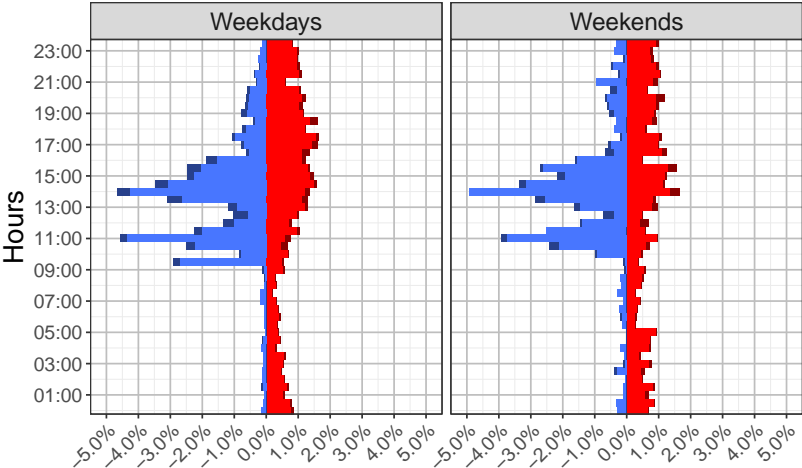
Unit	Date	Time	N Patient	Days	N Admission	N Discharge	N Tranfer In	N Transfer Out
Intern 1	2015-03-11	07:30	10	Wednesday	0	0	0	0
Intern 1	2015-03-11	08:00	10	Wednesday	0	0	0	0
Intern 1	2015-03-11	08:30	10	Wednesday	0	0	0	0
Intern 1	2015-03-11	09:00	10	Wednesday	0	0	0	0
Intern 1	2015-03-11	09:30	11	Wednesday	1	0	0	0
Intern 1	2015-03-11	10:00	11	Wednesday	0	2	0	0
Intern 1	2015-03-11	10:30	9	Wednesday	0	1	0	0
Intern 1	2015-03-11	11:00	8	Wednesday	0	0	0	0
Intern 1	2015-03-11	11:30	8	Wednesday	0	0	0	0
Intern 1	2015-03-11	12:00	8	Wednesday	0	0	0	0
Intern 1	2015-03-11	12:30	8	Wednesday	0	0	0	0
Intern 1	2015-03-11	13:00	8	Wednesday	0	0	0	0
Intern 1	2015-03-11	13:30	8	Wednesday	0	0	0	0

Plot Intern 1



Group Admissions Discharges Transfers in Transfers out

Plot Intens 1



Group Admissions Discharges Transfers in Transfers out

Conclusion

Conclusion

- Detailed data on unit and daily levels
- Combination of R functions
- Modelling nurse staffing
- Modelling mortality

Thank you for
your attention!



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