



Les réanimateur.rice.s hors de leurs murs

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Les Hôpitaux
Universitaires
de STRASBOURG



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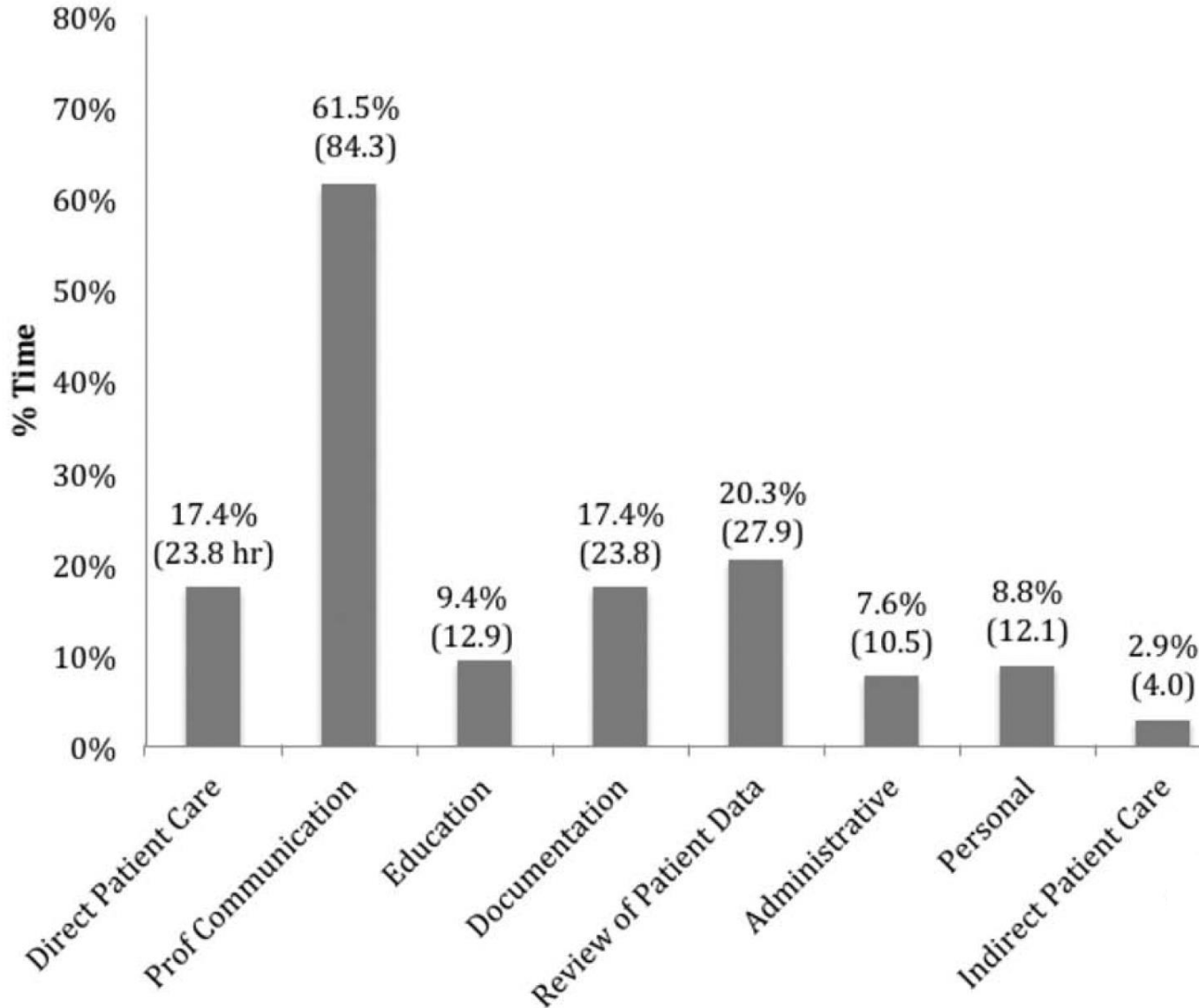
ICU workflow

- Many data exists regarding the workflow of medical doctors
 - Limit: studies focus primarily on academic hospitals and activities of physicians in training
- Few data exists regarding the workflow of intensivists
- Even less data exists about intensivists activities outside of ICU
- The different organization of ICU in the world makes the analysis even more complex

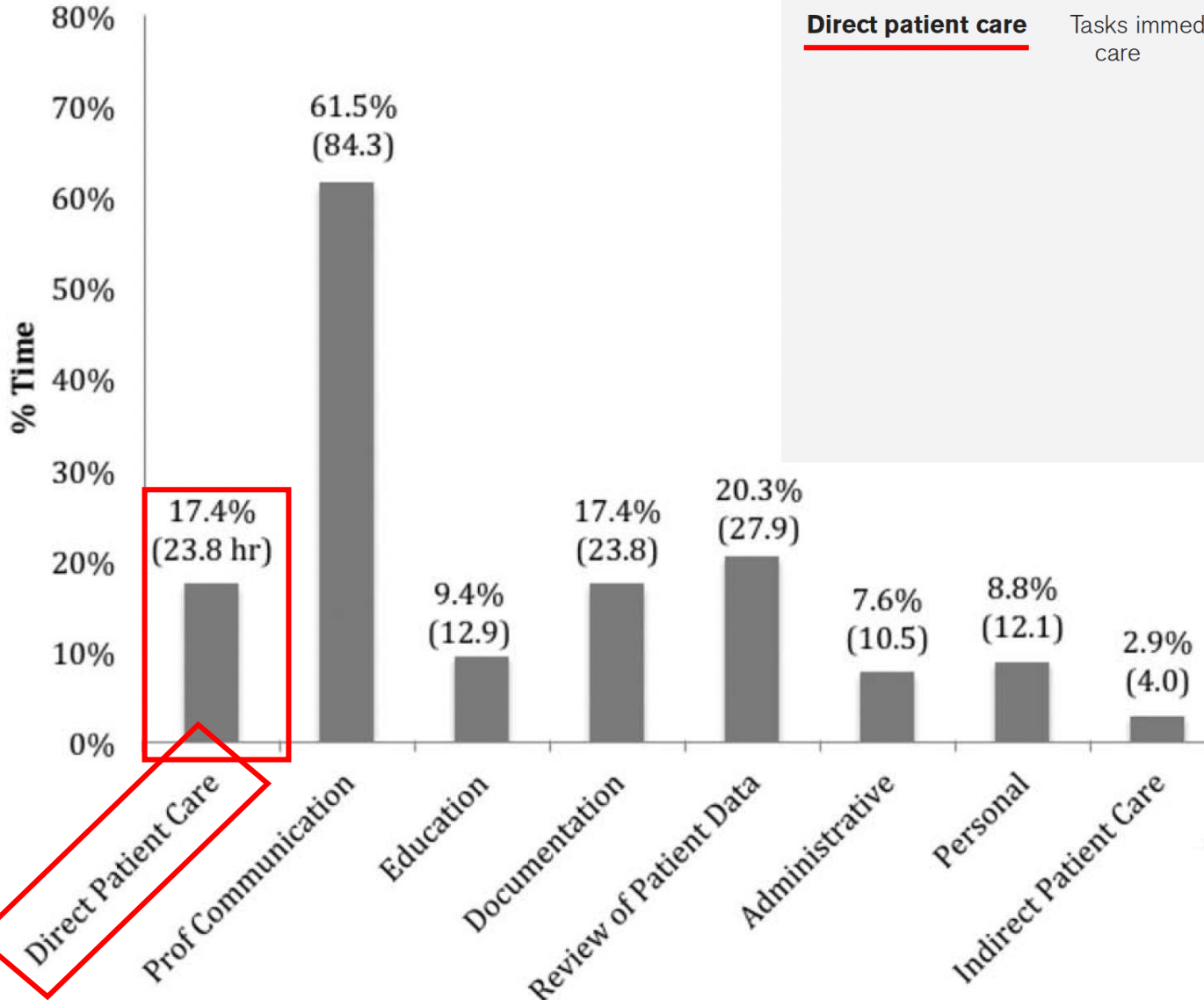
A Time-Motion Study of ICU Workflow and the Impact of Strain*

- Prospective, observational time-motion study.
- Setting:
 - From 2013 to 2014
 - 5 ICUs in 2 hospitals at an academic medical center (NYC)
- Subjects: 30 attending and resident physicians.
- Measurements: In 137 hours of field observations

A Time-Motion Study of ICU Workflow and the Impact of Strain*

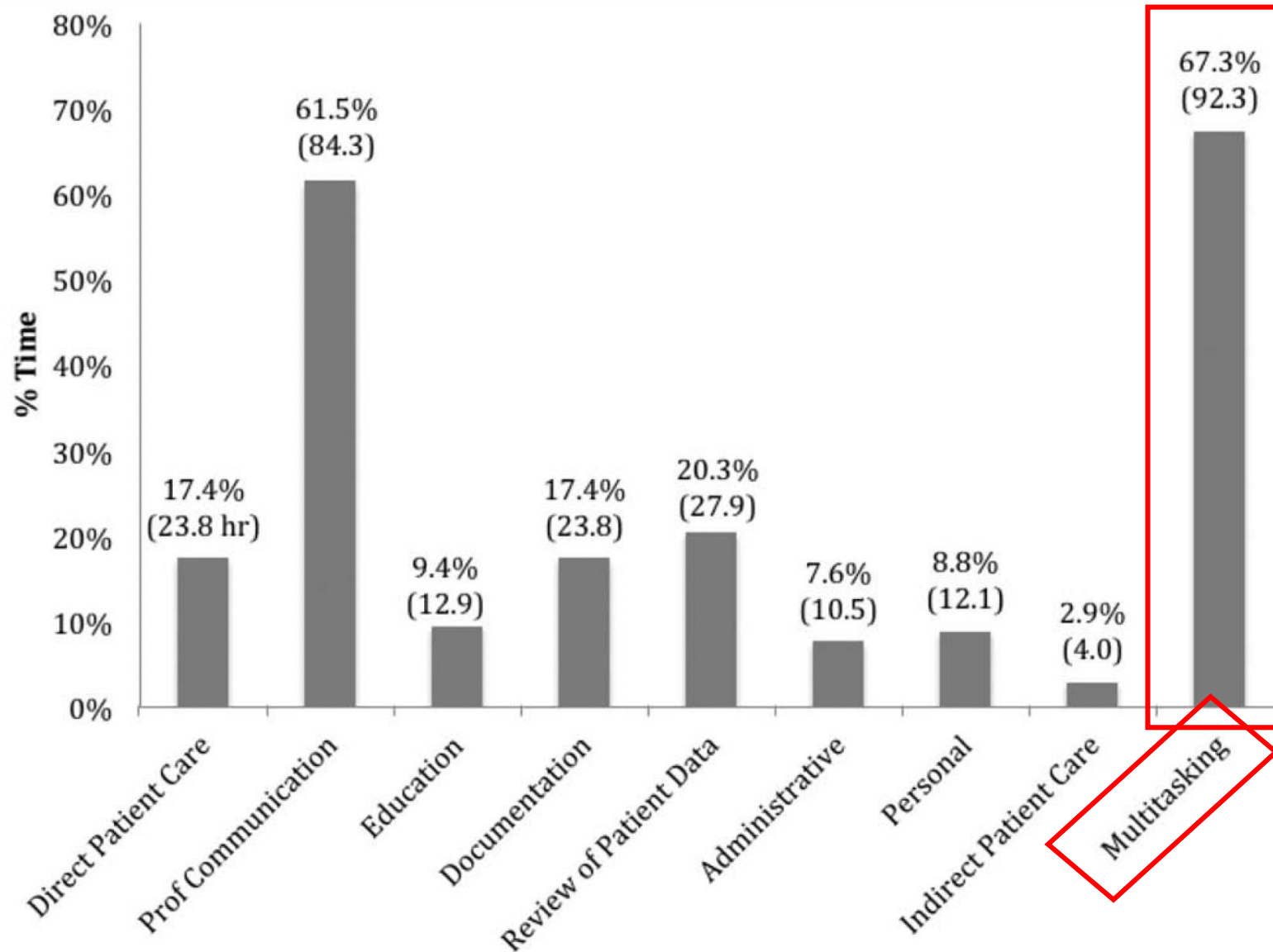


A Time-Motion Study of ICU Workflow and the Impact of Strain*



Work Task	Definition	Includes
<u>Direct patient care</u>	Tasks immediately related to patient care	<p>Communication: direct communication with patient and/or family (includes talking about medication decisions, admitting patient, plan of care)</p> <p>Examination: Examining/evaluating a patient, includes bedside ultrasound</p> <p>Monitoring and therapy: watching monitors (inside patient room), checking/changing ventilator settings, administering medications, transporting patient, observing procedures</p> <p>Rapid response/cardiac arrest: coding patient in the ICU or responding to acute decompensation</p> <p>Procedure: performing/assisting medical procedures (includes preparation and clean up)</p> <p>Other: assisting patient into bed, etc.</p>

A Time-Motion Study of ICU Workflow and the Impact of Strain*



Tasks were interrupted an average of 2.5 times/hr.

A Time-Motion Study of ICU Workflow and the Impact of Strain*

Limits:

- \approx 80% of the observations occurred during weekday daytime hours.
- Academic hospital
- Open ICU (USA) Vs Closed ICU (EU)
- Hawthorne effect
- Out of the ICU workflow?



Out of the ICU shifting as a significant workload

H. Merdji^{1,2}, R. Clere-Jehl¹, A. Dargent^{3,4}, P. Andreu³, A. Large³, F. Lefebvre⁵, M. Schenck⁶, J. Helms¹, J. P. Quenot^{3,4,7} and F. Meziani^{1,2*}

- Retrospective observational study
- During 5 years, from January 2012 to December 2016
- 2 academics medical ICU (Strasbourg and Dijon)
- After each intervention outside the ICU, the intensivist timed the intervention. Every day during the morning medical staff, the anonymized data were collected in a register.

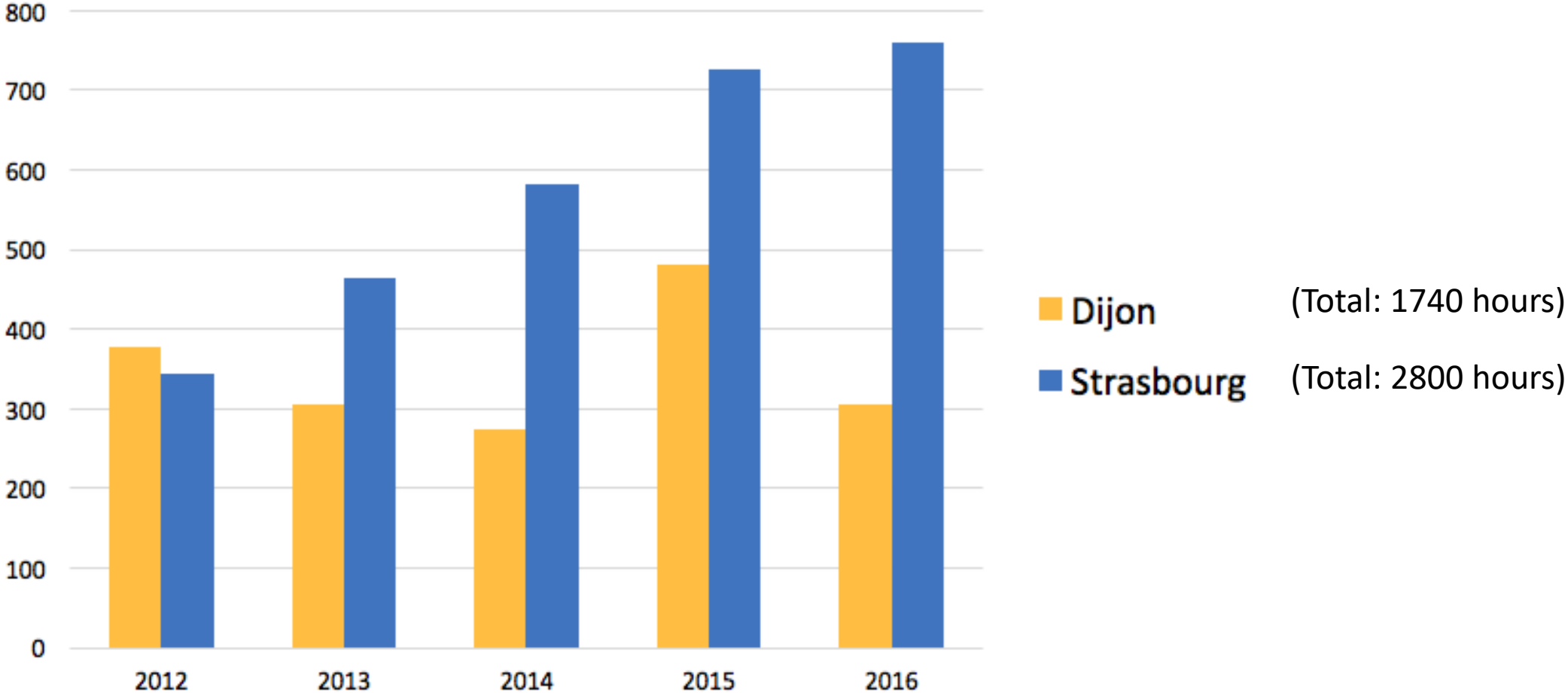


Out of the ICU shifting as a significant workload

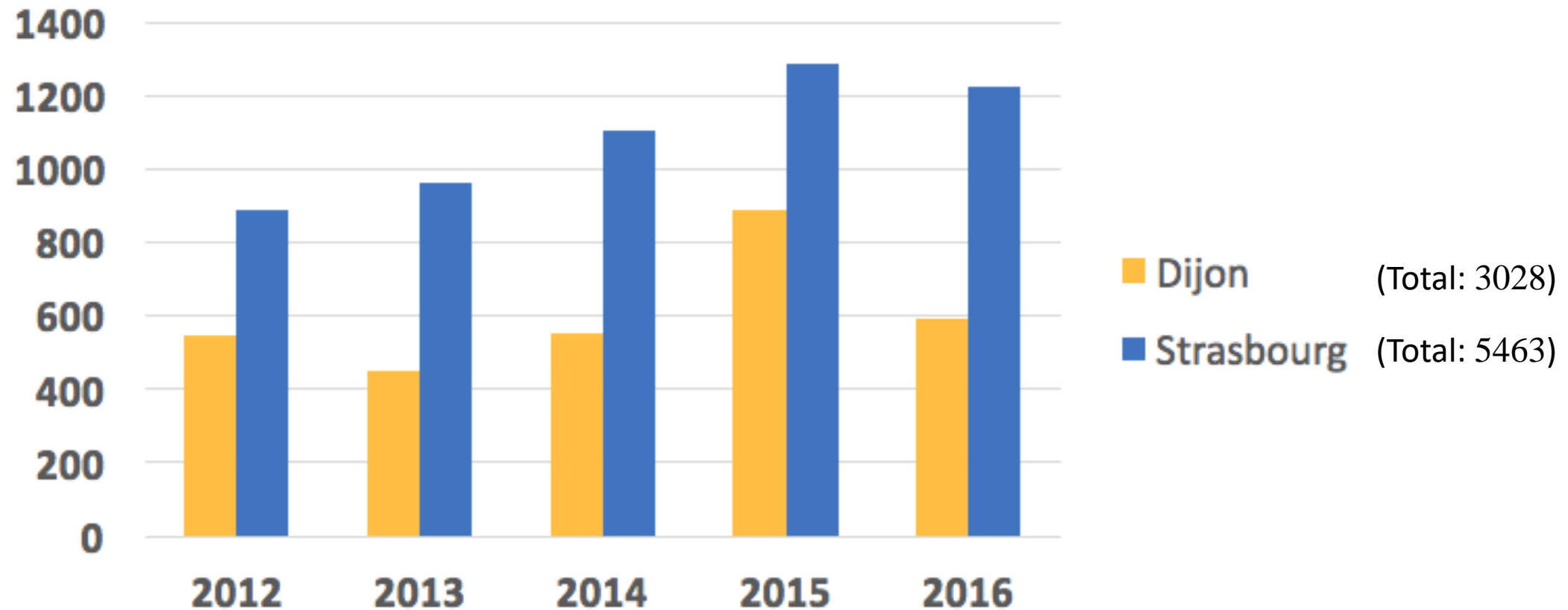
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- **Strasbourg NHC ICU:**
 - 25 beds
 - 7 full-time equivalent (FTE) physicians
 - Monoblock building 90,000 m² with 715 beds
- **Dijon ICU:**
 - 15 beds
 - Average of 4,3 FTE physicians during the 5 years.
 - Monoblock building of 80,000 m² with 1231 beds.

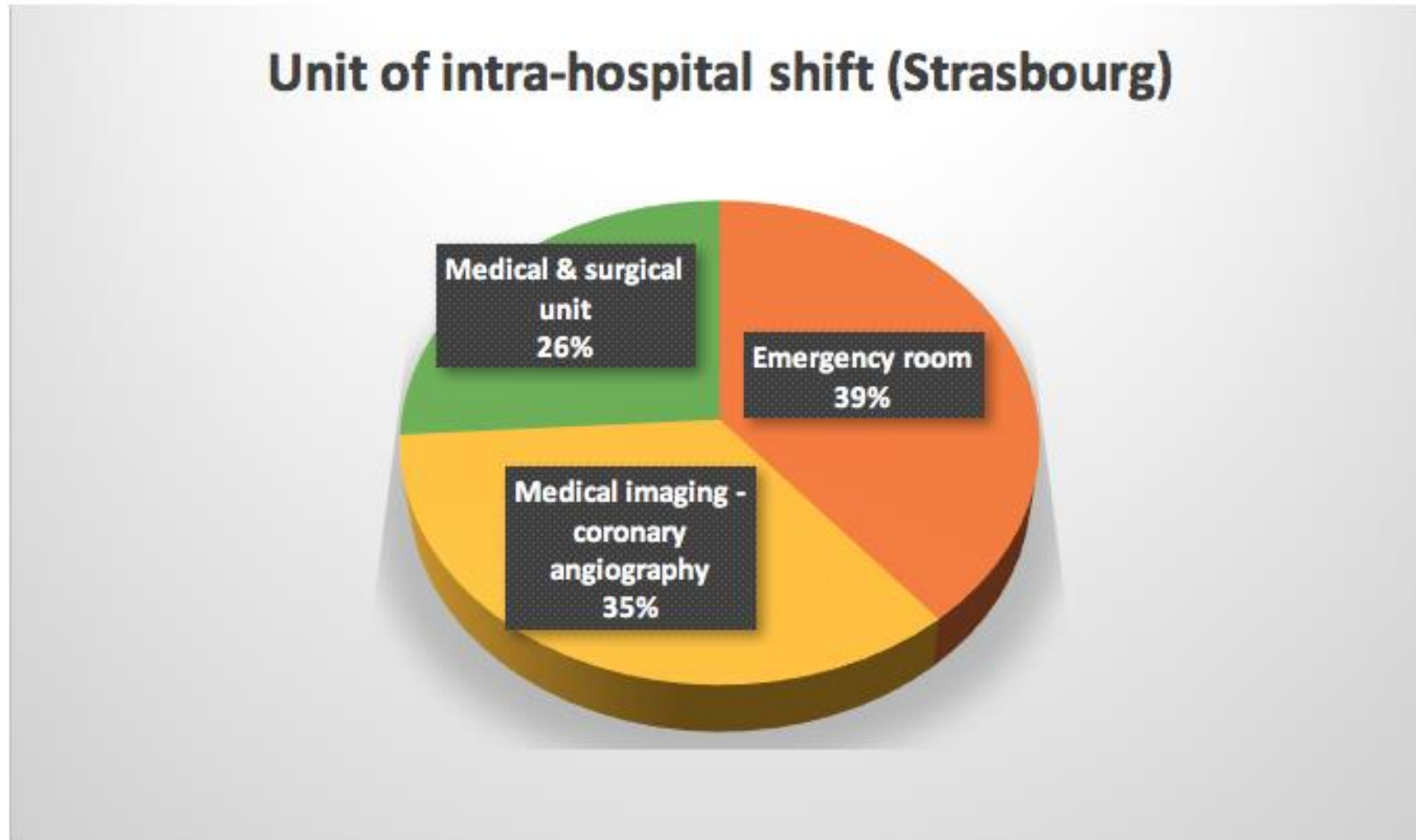
Hours spent out of the iCU



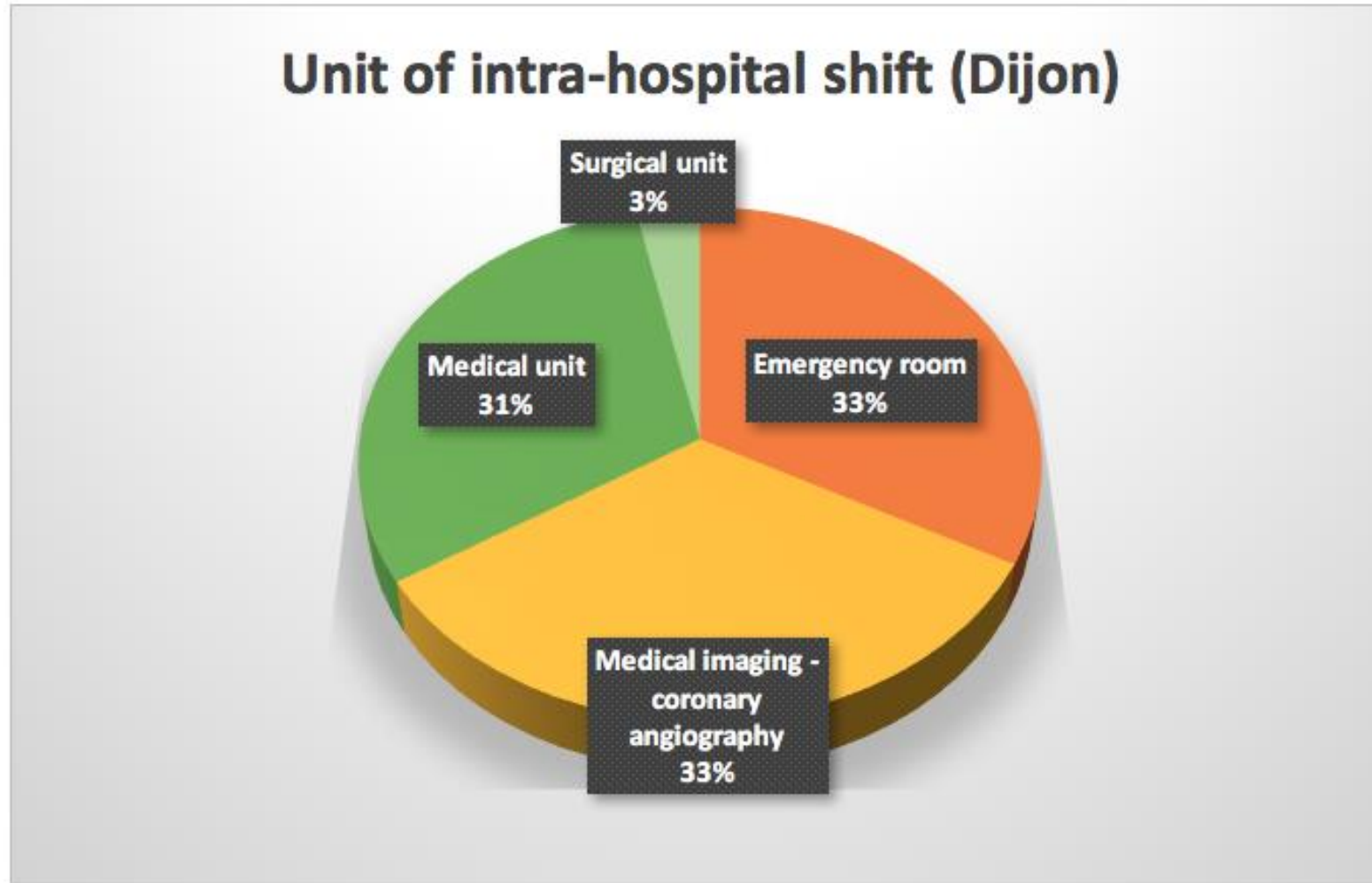
Number of intensivists' shift out of the ICU



Unit of intra-hospital shift (Strasbourg)



Unit of intra-hospital shift (Dijon)





Out of the ICU shifting as a significant workload

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- When reported to the number of FTE physician:
 - **more than 80 hours** spent outside the ICU every years per FTE physician.
 - **≈ 1/3** of a FTE intensivist's work per year.
- When intensivists are outside the ICU, they are not at ICU patients' bedsides.
 - real problem, especially during nighttime intensivist staffing



Time spent
outside the
ICU

Effect of Ambient Workload in the Intensive Care Unit on Mortality and Time to Discharge Alive

- Database / 2 Canadian ICU
- From 2002 to 2003
- 1705 patients

Table 2. Odds ratios for workload covariates included in hospital mortality model*

	OR (95% CI)	Unit
Mean APACHE II scores of other patients on day of admission	1.01 (0.92, 1.11)	Per point
ICU census on day of ICU admission	0.97 (0.92, 1.02)	Per patient
Other new admissions on day of ICU admission	0.98 (0.89, 1.09)	Per patient
New admissions on middle days of ICU stay	0.94 (0.80, 1.12)	Per patient
New admissions on last day of ICU stay	0.92 (0.84, 1.02)	Per patient
MODS of other patients on day of ICU admission	0.94 (0.82, 1.07)	Per point
MODS of other patients on middle days of ICU stay	0.95 (0.77, 1.17)	Per point
MODS of other patients on last day of ICU stay	0.82 (0.72, 0.94)	Per point
Number of "code blues" on day of ICU admission	0.96 (0.82, 1.11)	Per event
Number of code blues on middle days of ICU stay	1.18 (1.01, 1.37)	Per event
Number of code blues on last day of ICU stay	0.99 (0.75, 1.30)	Per event

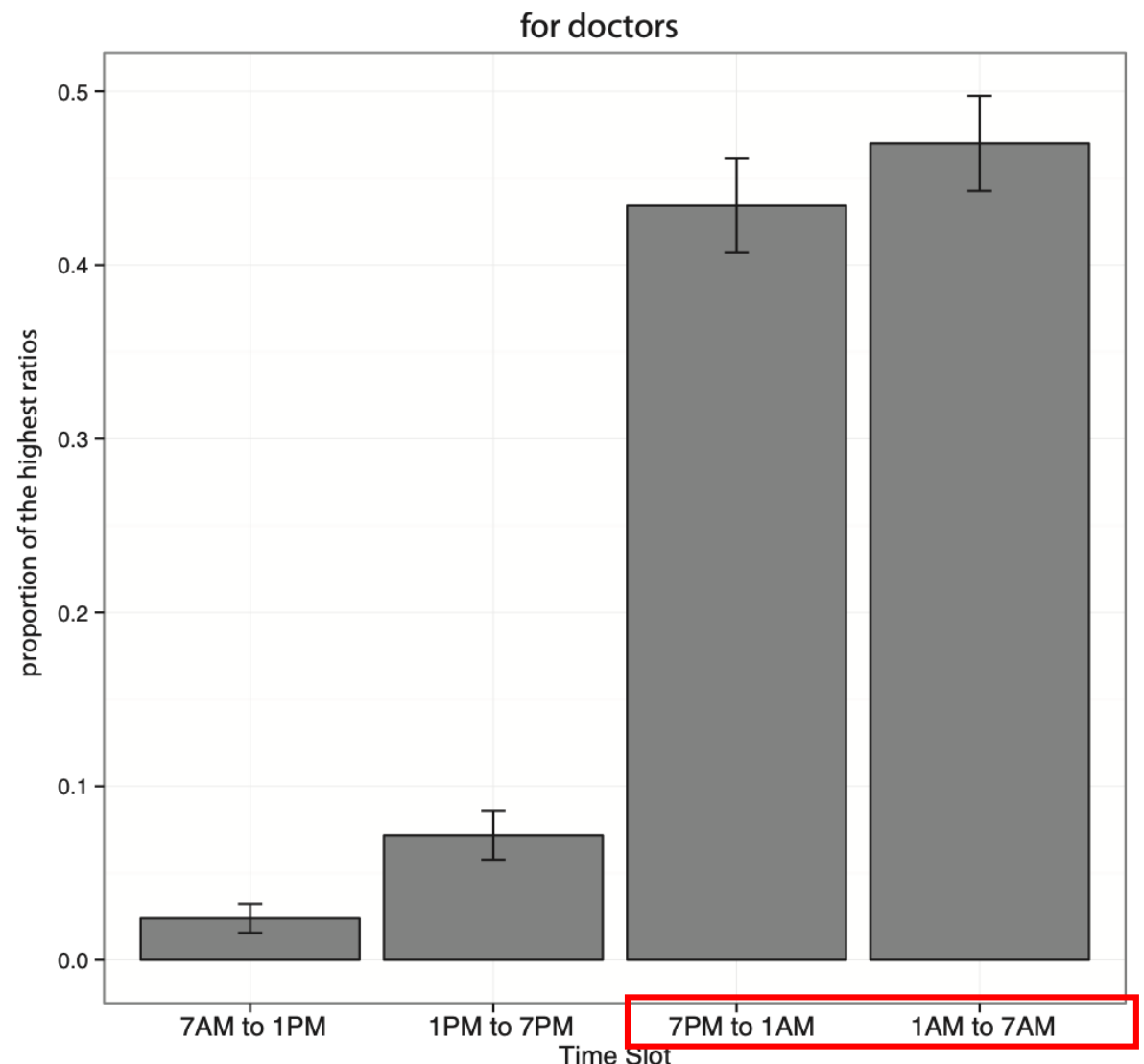
Patient Mortality Is Associated With Staff Resources and Workload in the ICU: A Multicenter Observational Study*

- Multicenter longitudinal study using routinely collected hospital data.
- **Setting:**
 - 8 ICUs from 4 university hospitals of Lyon
 - from January to December 2013
- **Patients:** 5,718 inpatient stays were included.
- (Medical residents included in the count of physicians).

	Shifts Without Death (<i>n</i> = 11,251)	Shifts With ≥ 1 Death (<i>n</i> = 415)	Unadjusted RR (95% CI)	Adjusted RR (95% CI)
<u>Patients-to-physician ratios (%)</u>				
< 8	8,144 (72.4)	256 (61.7)	1	1
8:1–10:1	1,391 (12.4)	59 (14.2)	1.0 (0.8–1.3)	0.9 (0.7–1.3)
10:1–14:1	1,408 (12.5)	74 (17.8)	1.0 (0.8–1.3)	1.1 (0.8–1.5)
> 14:1	308 (2.7)	26 (6.3)	1.5 (1.0–2.1)	2.0 (1.3–3.2) ^a

a = *p* < 0.01

Patient Mortality Is Associated With Staff Resources and Workload in the ICU: A Multicenter Observational Study*



Ratio > 14 patients/physician were represented during 3% of the time shifts mainly at night (87% vs 13%; $p < 0.001$)

Patient Mortality Is Associated With Staff Resources and Workload in the ICU: A Multicenter Observational Study*

Limits:

- Automated monitoring system
- Out of the ICU workflow?





Rapid Response Team (RRT)

Rapid-Response Teams

Daryl A. Jones, M.D., M.B., B.S., Michael A. DeVita, M.D.,
and Rinaldo Bellomo, M.D., M.B., B.S.

Table 1. Comparison between a Traditional Code Team and a Rapid-Response Team.*

Feature	Traditional Code Team	Rapid-Response Team
Typical criteria for calling the team	No recordable pulse, no recordable blood pressure, absence of respiratory effort, unresponsive	Low blood pressure, rapid heart rate, respiratory distress, altered consciousness
Typical conditions that the team assesses and treats	Cardiac arrest, respiratory arrest, airway obstruction	Sepsis, pulmonary edema, arrhythmias, respiratory failure
Typical team composition	Anesthesia fellow, ICU fellow, internal-medicine house staff, ICU nurse	ICU fellow, ICU nurse, respiratory therapist, internal-medicine house staff
Typical call rate (no./1000 admissions)	0.5–5	20–40
Typical in-hospital mortality (%)	70–90	0–20

Rapid response teams improve outcomes: yes

Daryl Jones^{1*}, Francesca Rubulotta² and John Welch³

Table 1 Summary of rationale and benefits of the rapid response team and rapid response system

RRTs are the first clinician-led, patient-centred, organisation-wide initiatives aimed at making hospitals safer

Ward teams do not reliably recognise instability or always escalate patient care appropriately

Serious adverse events are usually preceded by objective signs of deterioration, often for several hours. These signs can be used as calling criteria for the RRT

In-hospital cardiac arrests are relatively infrequent, and the rate of RRT review in mature RRSs exceeds in-hospital cardiac arrest rates several-fold

Systematic review and meta-analysis indicated that RRTs reduce in-hospital cardiac arrests and possibly hospital mortality

RRTs participate in end-of-life care in about a third of cases; therefore, introduction of RRTs may improve end-of-life care

RRTs may indirectly improve patient care by (a) supporting and educating ward staff, (b) triaging deteriorating patients who are appropriate for ICU, (c) enabling audit and learning about at-risk and deteriorating patients, thereby improving care processes

RRTs facilitate communication across departments and pathways and encourage the development of new technology for patient-centred care and detection and monitoring of at-risk and deteriorating patients

**Rapid response teams improve
outcomes: yes**

Daryl Jones^{1*}, Francesca Rubulotta² and John Welch³

**Rapid response teams improve
outcomes: no**

Ritesh Maharaj^{1*} and Henry T. Stelfox²

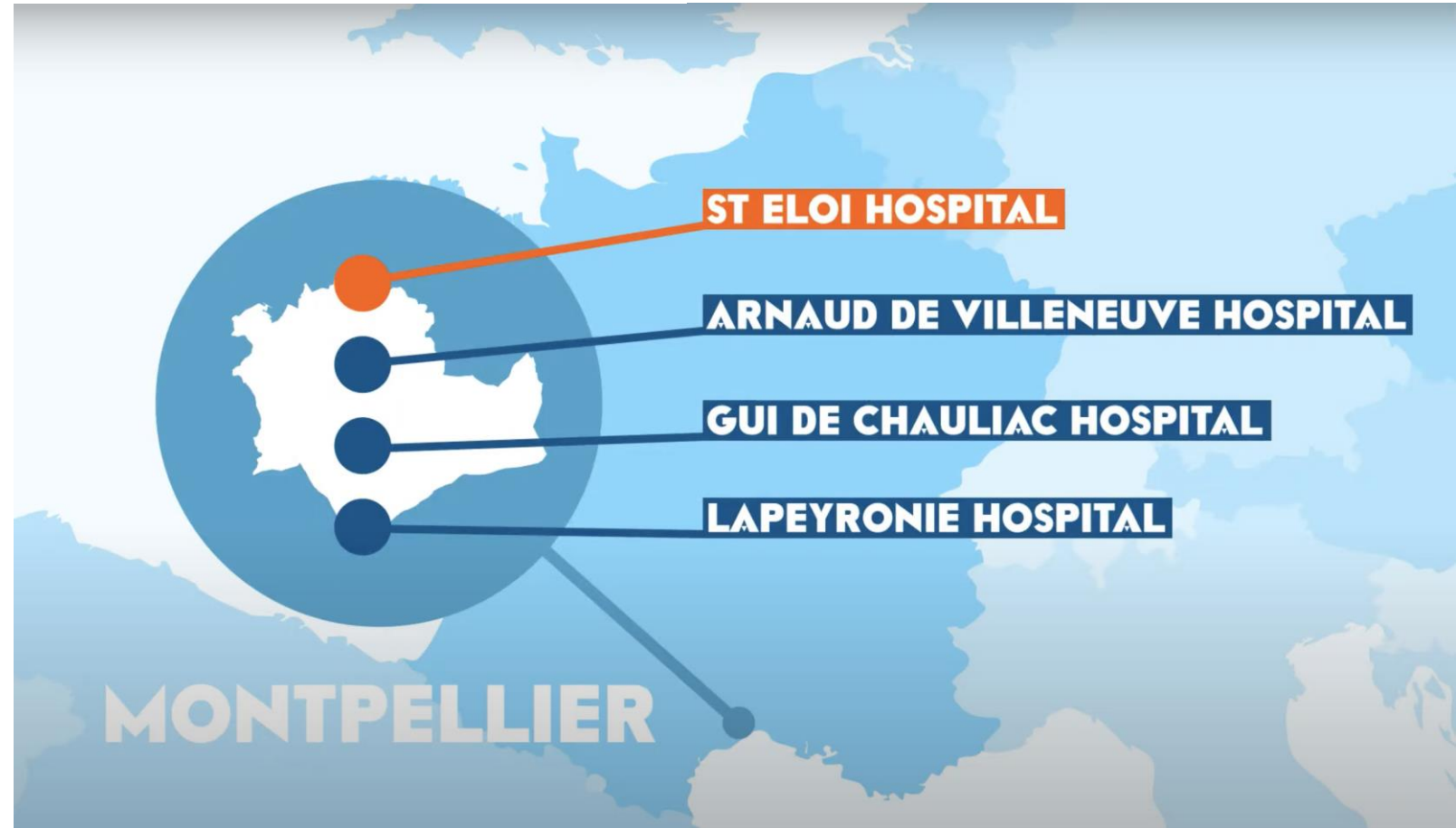
**Rapid response teams improve
outcomes: we are not sure**

Julia Wendon¹, Carol Hodgson² and Rinaldo Bellomo^{2*}

Rapid response team and hospital mortality in hospitalized patients

Boris Jung^{1,2†}, Aurelien Daurat^{1†}, Audrey De Jong^{1,2}, Gerald Chanques^{1,2}, Martin Mahul¹, Marion Monnin¹, Nicolas Molinari³ and Samir Jaber^{1,2*}

- Implementation of an intervention and a comparison with retrospective data
- 4 hospitals / CHU de Montpellier



Rapid response team and hospital mortality in hospitalized patients

- Intervention:
 - intensivist-led RRT implemented
 - educational modules / publicity
 - and bedside simulation-based training only in one of the four hospitals
- Adult (>24 h) in the medical-surgical wards from:
 - RRT period: January 2012 to June 2012
 - Pre-RRT period: July 2010 to December 2011
 - Post-RRT period: July 2012 to December 2013



SIGNES CLINIQUES D'ALERTE



CIRCULATION

- * Arrêt cardiaque
- * Fréquence cardiaque $< 40/\text{min}$ ou $> 140/\text{min}$
- * Pression Artérielle Systolique $< 80 \text{ mmHg}$



RESPIRATOIRE

- * Arrêt respiratoire
- * Détresse respiratoire (fréquence respiratoire $< 8/\text{min}$ ou $> 30/\text{min}$)
- * Saturation en oxygène (SpO_2) $< 90\%$ avec $\text{O}_2 > 6\text{l}/\text{min}$
- * Gêne respiratoire chez un patient trachéotomisé

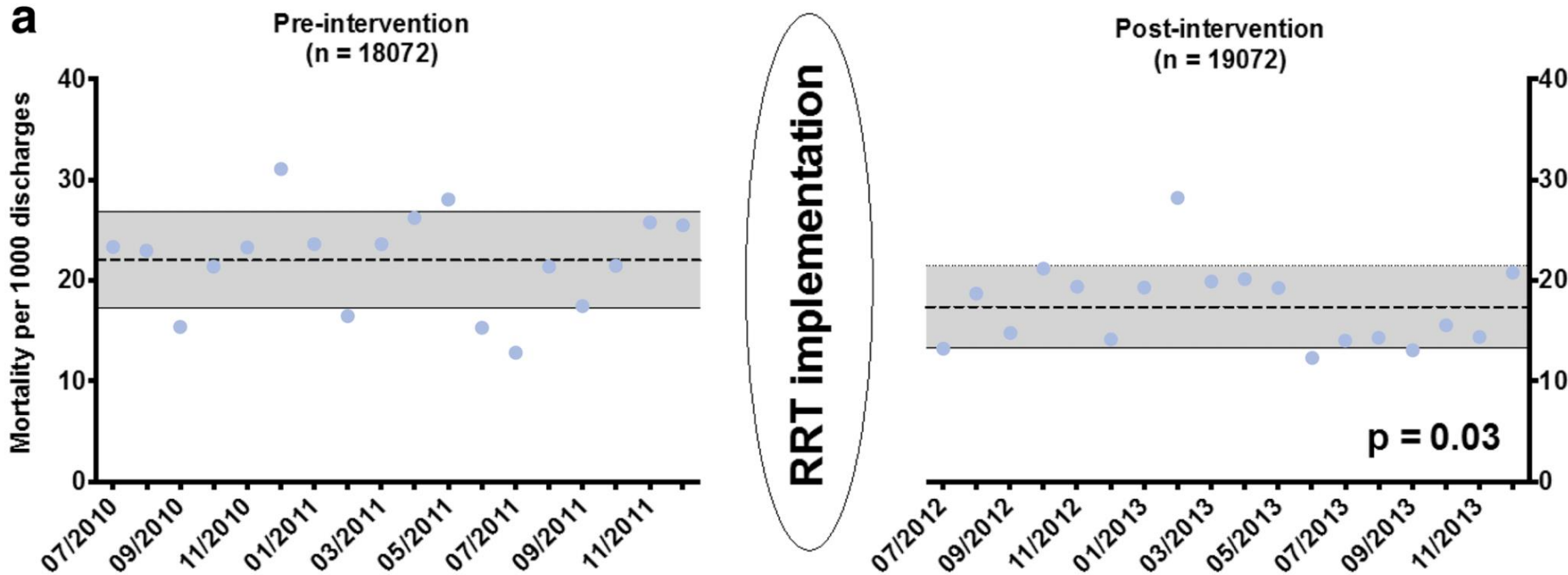


NEUROLOGIQUE

- * Patient non réveillable, modification brutale de l'état de conscience
- * Convulsions

Rapid response team and hospital mortality in hospitalized patients

RRT hospital

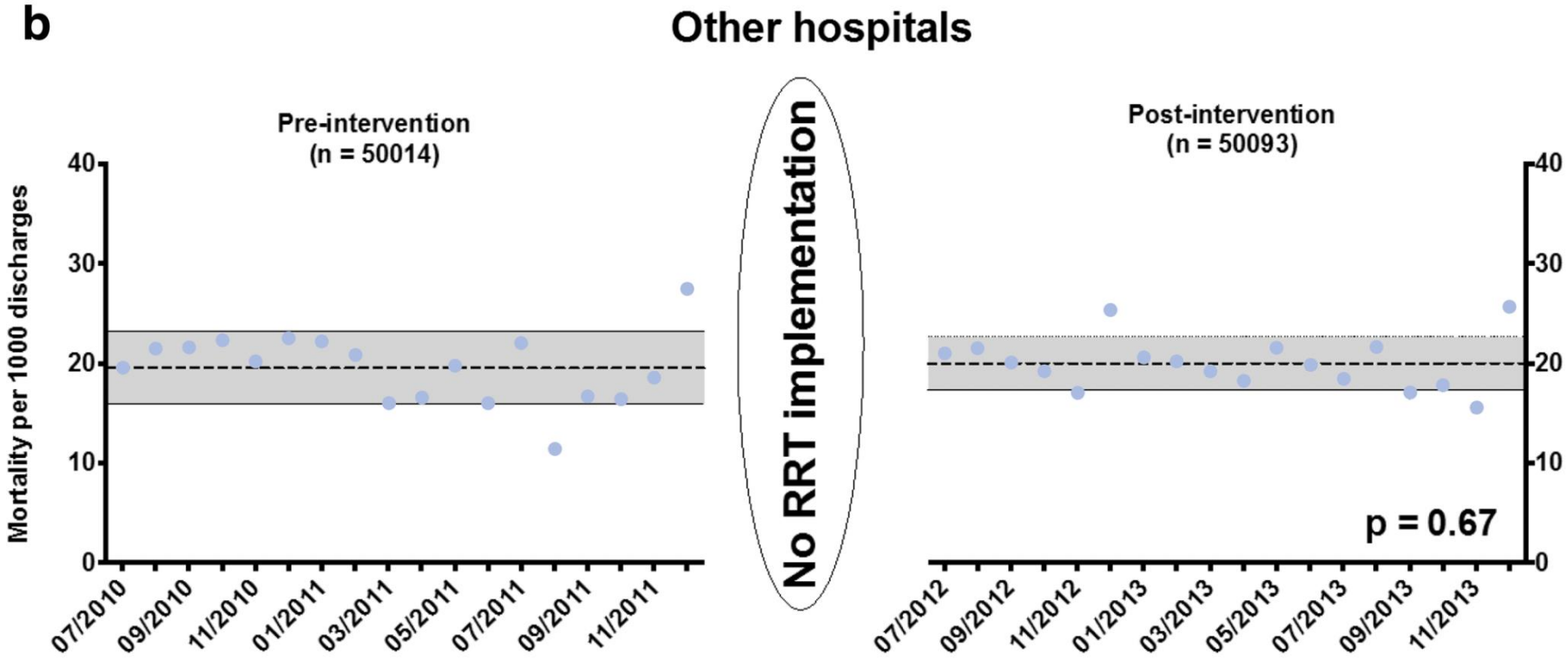


20.6 % drop in unexpected mortality

1.5 lives saved per week in the RRT hospital

Evolution of unexpected death rate per 1000 discharges by month in the RRT hospital

Rapid response team and hospital mortality in hospitalized patients



Evolution of unexpected death rate per 1000 discharges by month in the RRT hospital

Rapid response team and hospital mortality in hospitalized patients

Position of activator calling RRT	
Nurse	167 (30)
Resident	273 (48)
Fellow or attending	105 (19)
Non medical staff	19 (3)

Rapid response team and hospital mortality in hospitalized patients

RRT activations	564 (100)
RRT main activation criteria	
SpO ₂ <90 %	97 (17)
SBP <80 mmHg	79 (14)
Altered mental status	76 (14)
Respiratory rate >30 c/min	54 (10)
Dyspnoea	45 (8)
Unspecific clinical concern	36 (6)
Heart rate >140 bpm	35 (6)
Cardiac arrest	27 (5)
Haemorrhage	21 (4)
Seizure	13 (2)
Heart rate <40 bpm	4 (1)
Others	74 (13)

Rapid response team and hospital mortality in hospitalized patients

Median intervention time:
5 min

Initial diagnosis	
Sepsis	142 (25)
Severe sepsis/sepsis shock	121 (21)
Non severe sepsis	11 (2)
Immunodepression-related sepsis	10 (2)
Haemorrhage/haemorrhagic shock	45 (8)
Hypovolaemia	11 (2)
Acute heart failure/cardiogenic shock	52 (9)
Arrhythmia	12 (2)
Pulmonary embolism	11 (2)
Acute on chronic liver failure	38 (7)
Acute pancreatitis	11 (2)
Stroke	9 (2)
Seizure	17 (3)
Altered mentality	4 (1)
Anaphylaxis	15 (3)
COPD exacerbation	15 (3)
Acute renal failure	8 (1)
Drug overdose	7 (1)
Others	91 (16)
Missing data	76 (13)

Rapid response team and hospital mortality in hospitalized patients

Main primary action performed by RRT

Crystalloid infusion	123 (22)
Antibiotics	43 (8)
Peripheral line	39 (7)
Intubation	36 (6)
Colloid infusion	36 (6)
Diuretics	36 (6)
Strategy advice only	32 (6)
Transfusion	31 (5)
Compressions for acute bleeding	25 (4)
Nebulizer treatment	22 (4)
Vasopressor	21 (4)
Antiarrhythmic treatment	16 (3)
Non-invasive ventilation	12 (2)
Defibrillation	10 (2)
Flumazenil	10 (2)
Central venous access	6 (1)
Analgesics	5 (1)
Antiepileptic drugs	5 (1)
Others	47 (8)

Rapid response team and hospital mortality in hospitalized patients

- No overall significant change in ICU mortality, between the two study periods

Opération Code Bleu : mettons en place un numéro d'appel unique (2222) pour les urgences vitales intra-hospitalières !

A call for 2222 in European hospitals

A. Cariou^{1*} • J. Pottecher² • F. Adnet³ • D. Whitaker⁴ • P. Carli⁵ • É. Javouhey⁶ • P. Pasquier⁷ • A. Mercat⁸



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Tableau 1 - Comment faire au sein de son établissement ?

1. Alerter sa communauté sur l'intérêt du numéro unique (président de CME, direction hospitalière)
2. Valider la mise en œuvre avec la commission qualité et sécurité des soins et le groupe urgence vitale
3. Obtenir l'appui logistique de la direction qualité et des services techniques
4. Sanctuariser le 2222 avec l'aide des services de la téléphonie
5. Organiser une campagne de communication (affichage, e-mailing, etc..) indiquant la date prévue pour la bascule de l'ancien système vers le 2222
6. Actualiser la signalétique (affichage, stickers près des postes téléphoniques)
7. Prévoir une période de transition pendant laquelle l'ancien système demeure fonctionnel (et désactiver cet ancien système après avoir vérifié qu'il n'était plus employé)

Conclusion

- Few data exists regarding the workflow of intensivists (inside/outside)
- RRT are efficient and mainly done by ICU physicians in France
- A single telephone number (2222) could further optimize efficiency
- Out of the ICU activity is often unrecognized by the hospital administration and should now be taken into account

спасибо 谢谢
GRACIAS 谢谢

THANK YOU

ありがとうございました MERCI

DANKE धन्यवाद

شُكْرًا OBRIGADO