Challenges in ventilator-associated pneumonia

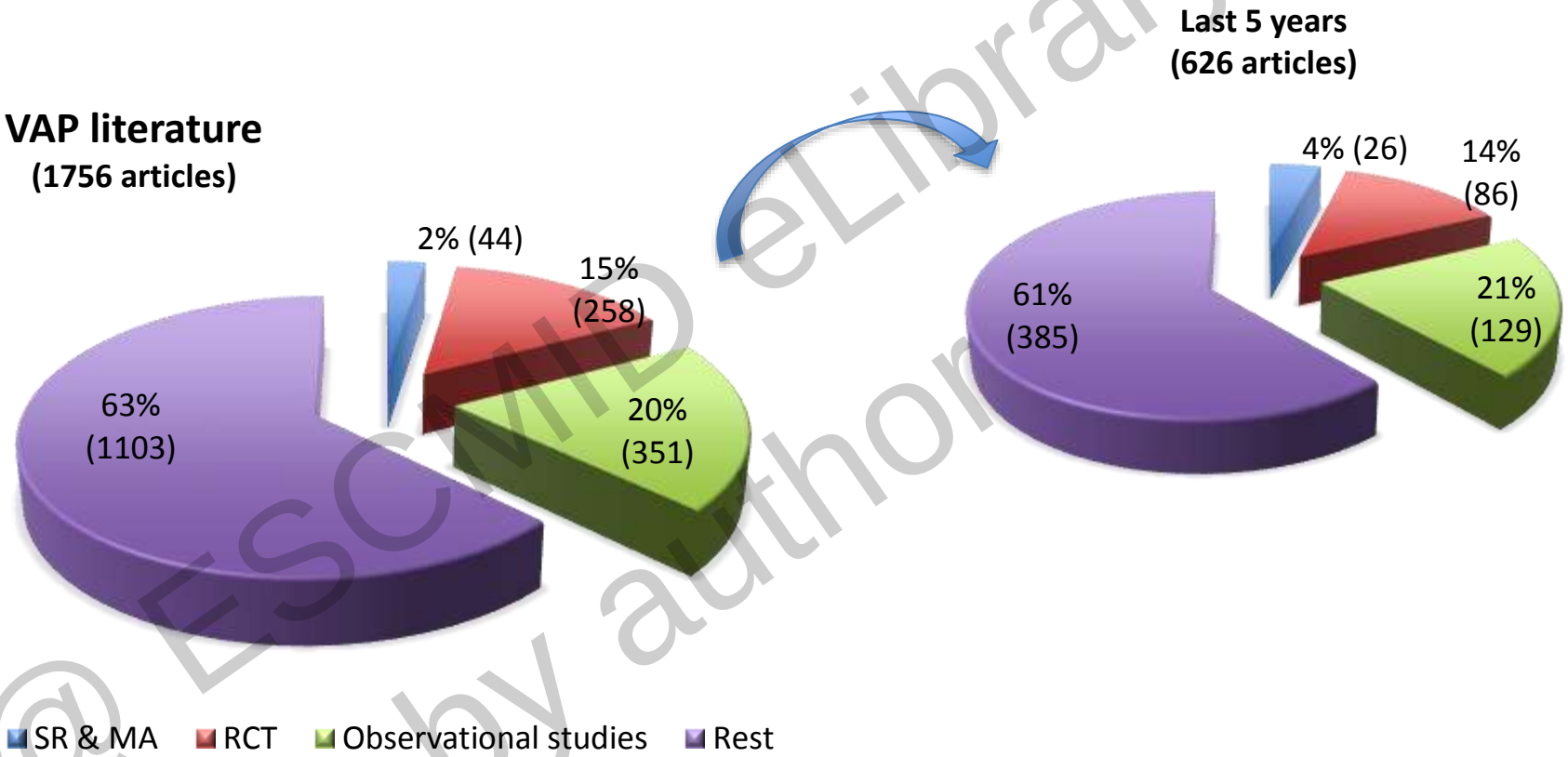
Candela Solé
UHN & Mount Sinai Hospital
Toronto, Canada
pm.nebat@gmail.com

Conflicts of interest

None


…so now, how do we solve it?
…the situation's diagnose: bad...
Prevention didn't work…
Do you want more evidence???
These… the true 4 challenges?!

Evidence



Epidemiology

Extended Prevalence of Infection in Intensive Care (EPIC II) study – 1265 ICUs, 75 countries

51% of adults admitted to ICU have an infection

64% have a respiratory infection

Attributable mortality is aprox. 13% (controversial issue)

Implies an increased duration of mechanical ventilation + ICU stay → increase in the costs

Rello et al. Lancet Respir Med 2014

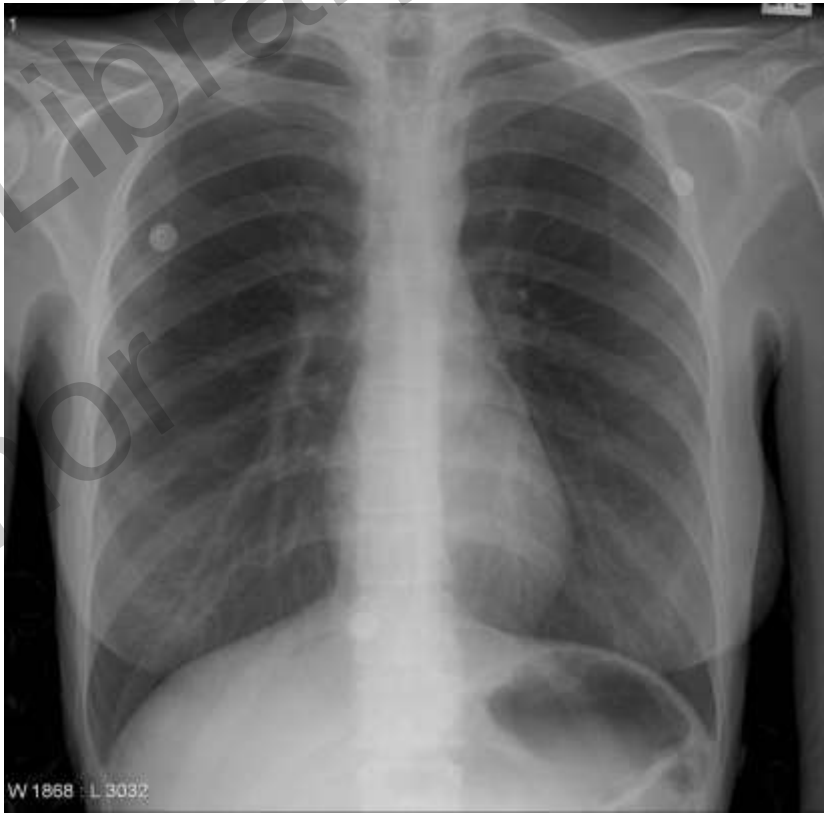
Clinical case

28 years old woman.

Admitted to the hospital one week ago:
vaginal delivery of first child.
No complications.
Discharged home after 3 days.

Presents to ED with:

- Fever of 40ºC with chills (started 48 hours ago)
- Tachycardia 140bpm
- BP 75/40mmHg
- RR 40x', SatO2 93% with nasal cannula at 2lx'



Clinical case

Probable septic shock due to retained products inside the uterus.

To-do list:

- Intubation & ventilation
- Fluid resuscitation
- Initiation of empiric therapy (ampicillin + clindamycin + minocycline)
- Blood cultures
- Call Gynecology for vaginal echography
  Diagnose retained placenta → Evacuation of the products

Clinical case

But… profuse bleeding during the procedure.
Hb 5g/dL, BP 70/40mmHg.
Hypovolemic shock due to hemorrhage.

- Control the bleeding.
- Transfusion + fluid resuscitation + vasoactive drugs.

Admission to ICU immediately after surgery.

Hemodynamically unstable for 7 days, needing vasoactive drugs.

Prevention

Complications to expect

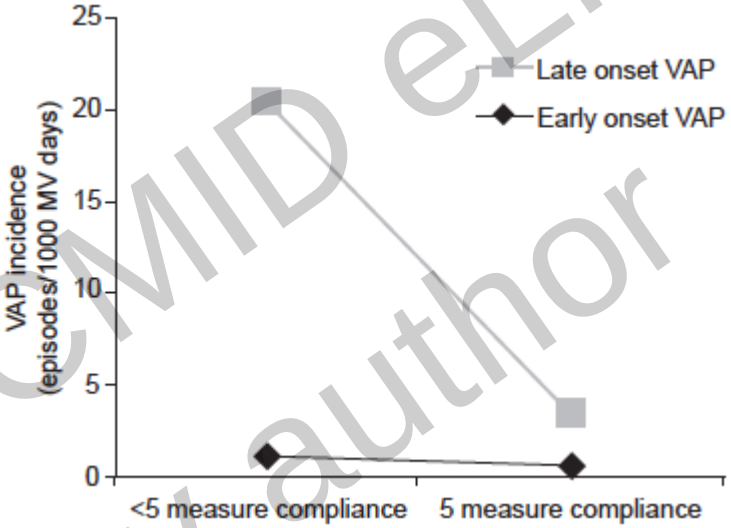
- Abdominal: peritonitis, adnexal infection, pelvic abscess, wound infection…
- Respiratory: **VAP**

European Care Bundles for VAP prevention

- Hand hygiene (specially before manipulation of the ventilator's circuit)
- Avoiding changes of the ventilator's circuit
- Oral hygiene (clorhexidine mouthwashes)
- Adequate cuff pressure
- Avoiding hypersedation

Prevention

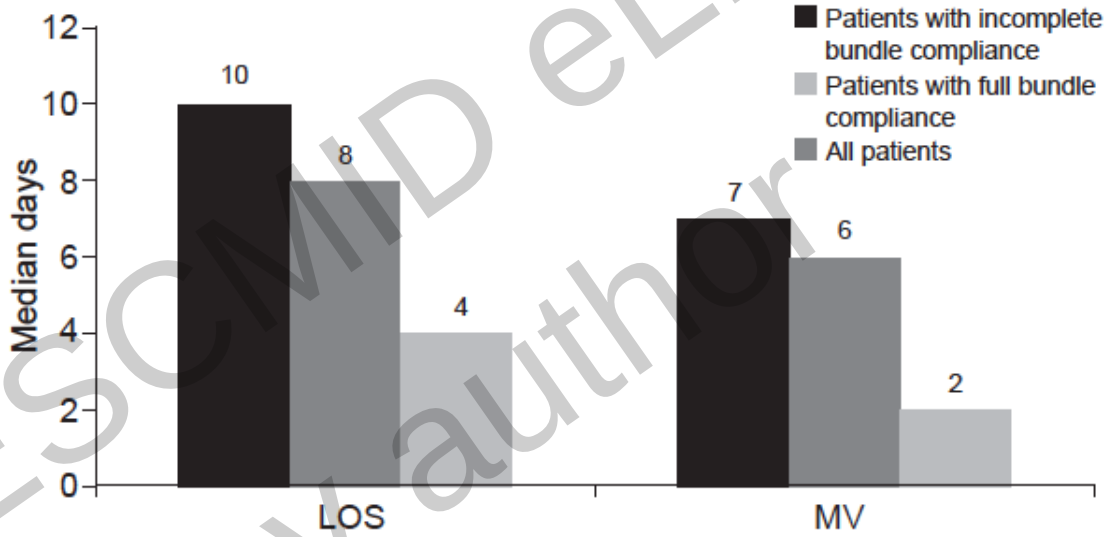
VAP incidence according to compliance



Rello et al. CMI 2013; 19:363-369

Prevention

ICU length of stay and MV duration according to compliance



Rello et al. CMI 2013; 19:363-369

Back to our clinical case…

4th day after admission.

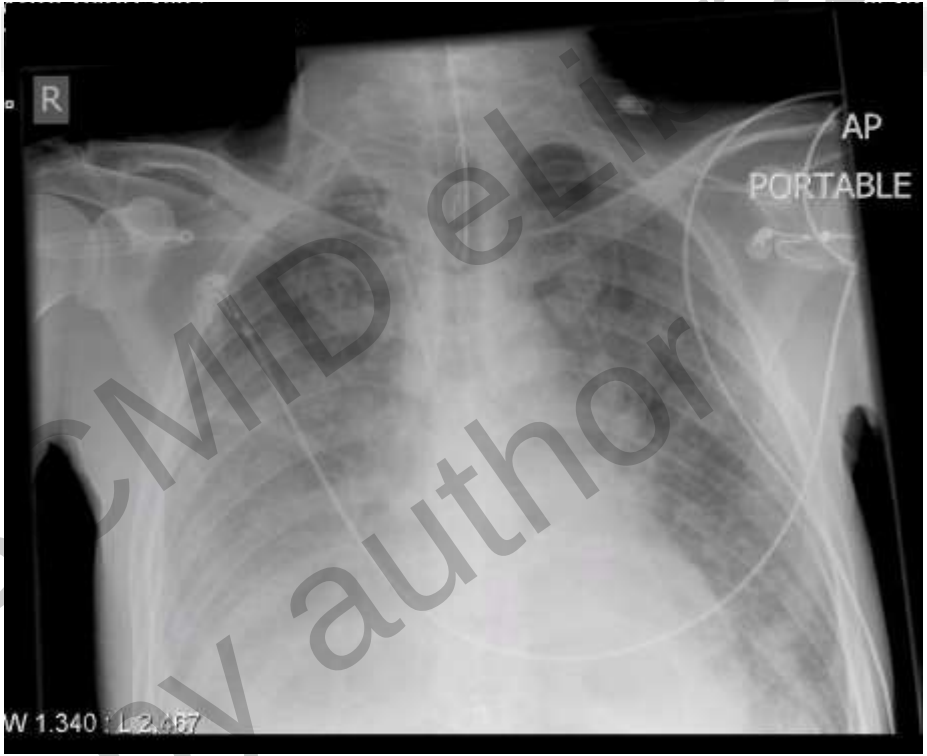
Hemodynamically stable, but in the last 24 hours…

- Worsening hypoxia
- Fever

Exam:

No air entrance at all in her right basal lung… and diffused crackles.

Back to our clinical case…



Diagnose

You suspect that she has a VAP… but how can we diagnose her?

Tarragona

Paris
(La Pitié-Salpêtrière)

Toronto
(Toronto Western Hospital)

Diagnose

You suspect that she has a VAP… but how can we diagnose her?

Tarragona	Paris *(La Pitié-Salpêtrière)*	Toronto *(Toronto Western Hospital)*
Medical-Surgical ICU	Medical-Surgical Cardiac ICU	Neurosurgical ICU
- No scores - CRP - ETA / PSB culture - Start antibiotics	- No scores - CRP and PCT - BAL - Direct microscopic examination of cytocentrifuged BALF stained with modified Wright-Giemsa stain (Diff-Quick) - Start antibiotics	- CPIS score > 6 - No CRP or PCT - BAL - Start antibiotics

Diagnose

Why those different approaches?

LOW SENSITIVITY & SPECIFICITY

HIGH INTEROBSERVER VARIABILITY

NO GOLD STANDARD

Therapy

Tarragona	Paris *(La Pitié-Salpêtrière)*	Toronto *(Toronto Western Hospital)*
Pseudomonas aeruginosa *Acinetobacter baumannii* MSSA	*Pseudomona aeruginosa* ESBL *Klebsiella spp.* Other *Enterobacteriaceae*	*Staphylococcus aureus* *Haemophilus influenzae* *Pseudomona aeruginosa*
Empirical therapy: Tarragona Strategy Meropenem + amikacin	Empirical therapy: 3rd generation cephalosporin + fluoroquinolone	Empirical therapy: Piperacillin/tazobactam + vancomycin

Therapy

The 10 points of the Tarragona Strategy

1. Started without delay
1. Choice of agent should be based on the regimen that the patient has received previously
1. Targeted based on direct stains
1. Modified based on microbiological findings
5. COPD patients or MV >1week should receive combination therapy

Therapy

6. MSSA strongly suspected if GCS<8. MRSA is not expected if no prior antibiotics
7. Vancomycin for MRSA-VAP has a very poor outcome
8. Antifungals are not necessary even if colonization by *Candida spp*.
8. Prolonging therapy does not prevent recurrences
8. Guidelines should be customized to local patterns

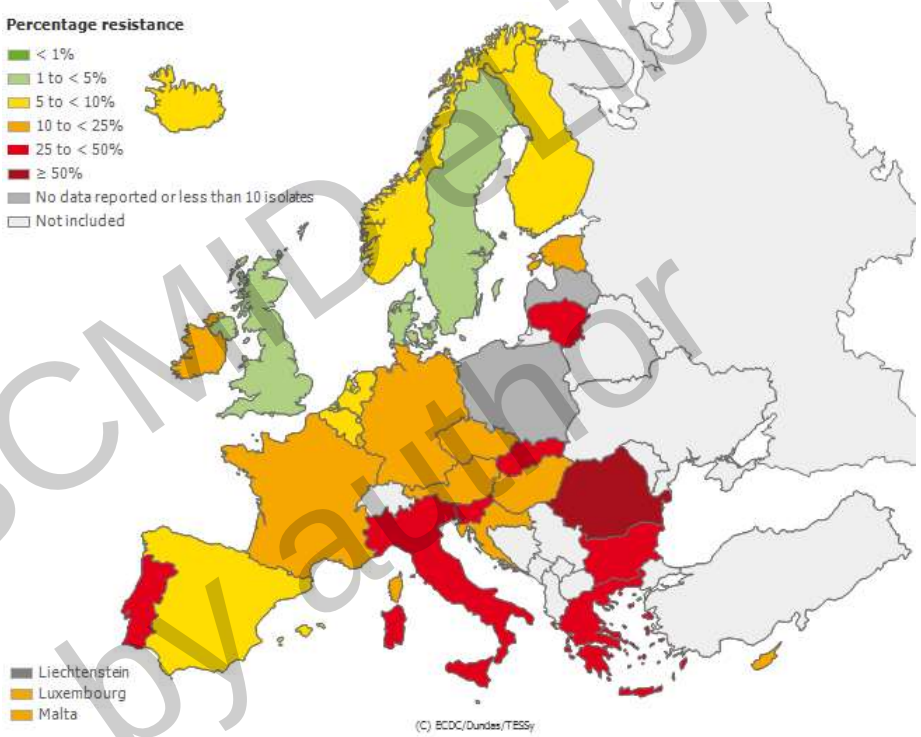
Sandiumenge et al. ICM 2003; 29:876-883

Therapy

Tarragona	Paris *(La Pitié-Salpêtrière)*	Toronto *(Toronto Western Hospital)*
De-escalate according to: - Clinical evolution to monotherapy - Results of the respiratory specimen to narrow spectrum	De-escalate according to: - Results of the BAL culture to narrow spectrum	De-escalate according to: - Results of the BAL culture to narrow spectrum
Stop according to clinical resolution (hypoxemia / fever)	Stop according to PCT	Stop after 7 days
		Antibiotic Stewardship rounds

Therapy

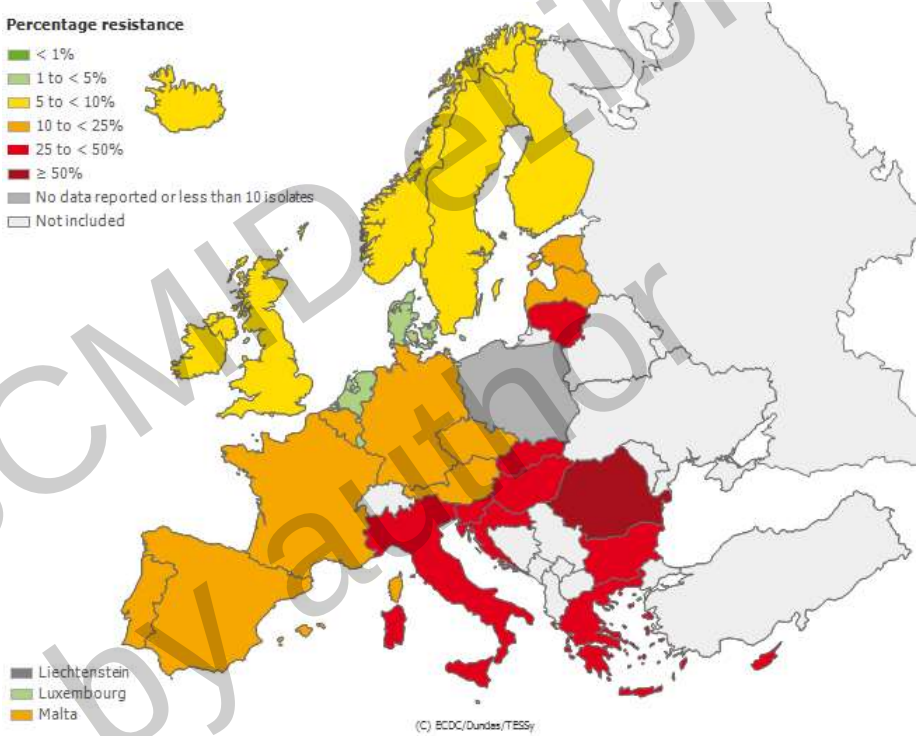
Piperacillin/Tazobactam Resistance *Pseudomonas aeruginosa* map



ECDC, 2014

Therapy

Carbapenem Resistance *Pseudomonas aeruginosa* map



ECDC, 2014

ESGCIP
ESCMID STUDY GROUP FOR CRITICALLY ILL PATIENTS
European Society of Clinical Microbiology and Infectious Diseases

Clinical Practice Guidelines
Nebulized antibiotics for MV patients

Indications to guide prescription of nebulized antibiotics

Characteristic	Asia (n = 37), n (%)	Europe (n = 32), n (%)	Australasia, Latin America and North America (n = 18), n (%)	Total (n = 87), n (%)
Prophylaxis immunocompetent	5 (13.5)	1 (3.1)	0 (0)	6 (6.8)
Prophylaxis immunocompromised	12 (32.4)	7 (21.8)	4 (22.2)	23 (26.4)
Empirical treatment for increased pulmonary secretions	10 (27)	1 (3.1)	0 (0)	11 (12.6)
Empirical treatment for fever or leucocytosis	10 (27)	2 (6.2)	0 (0)	12 (13.7)
Empirical treatment for decreased $PaFiO_2$	5 (13.5)	0 (0)	0 (0)	5 (5.7)
Empirical treatment for pulmonary x-ray infiltrates	6 (16.2)	1 (3.1)	0 (0)	7 (8)
Positive pulmonary specimen cultures	10 (27)	8 (25)	4 (22.2)	22 (25.2)
Positive pulmonary specimen cultures with MDRO	20 (54)	30 (93.7)	12 (66.6)	62 (71.2)

MDRO, multidrug resistant organism.

Solé-Lleonart et al. CMI 2015

Other aspects of VAP not covered in this talk…

- Ventilator-associated tracheobronchitis

- Need for radiologic images?

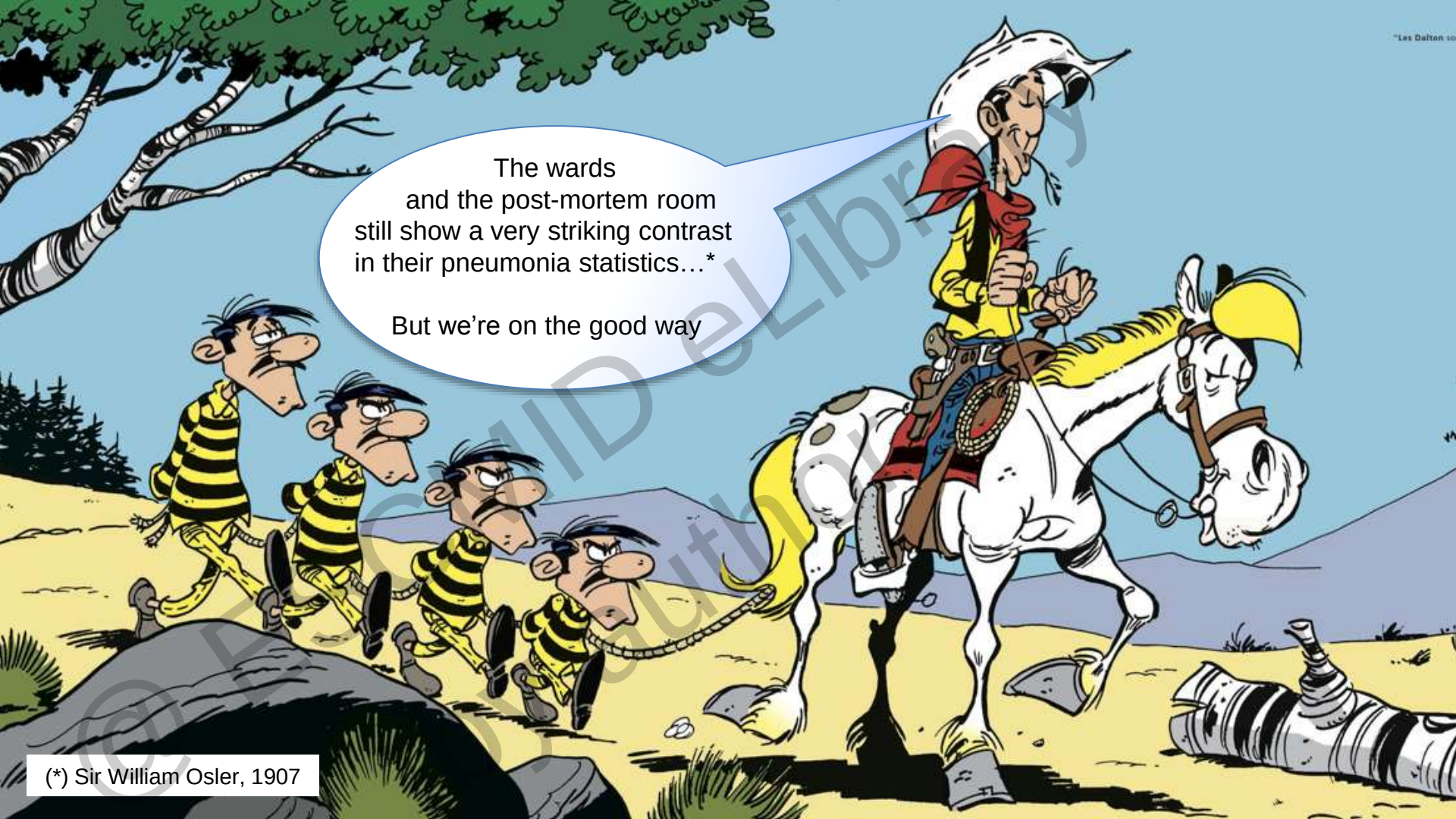
- Molecular diagnosis tests

Conclusions

1. Best prevention: avoid artificial airway

1. Lack of diagnostic gold standard

2. Personalized therapy according to local resistances and comorbidities


The wards
and the post-mortem room
still show a very striking contrast
in their pneumonia statistics…*
But we're on the good way
(*) Sir William Osler, 1907

Thank you

Candela Solé
pm.nebat@gmail.com