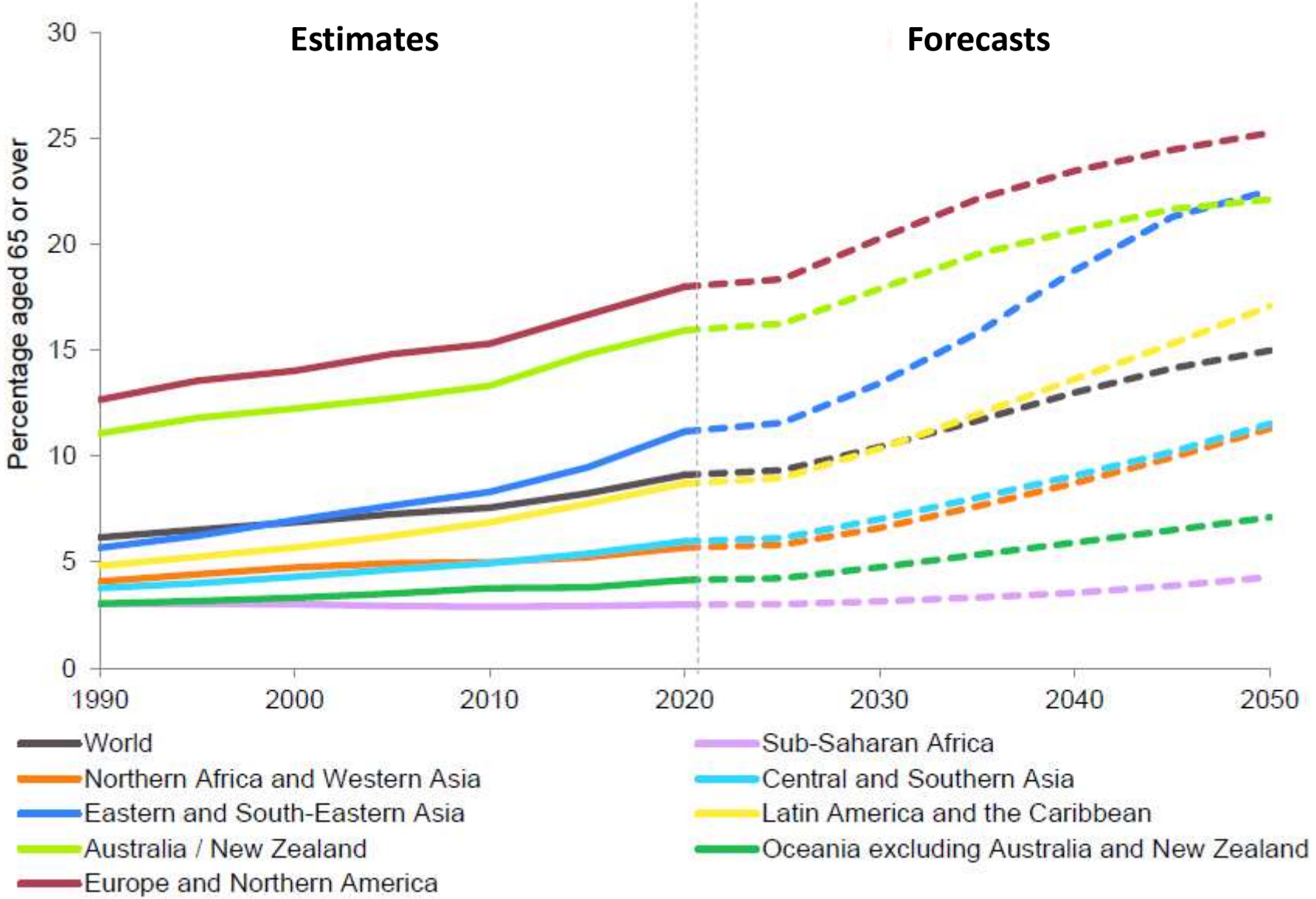
Severe pneumonia in elderly.
Who should be hospitalized in ICU?

Pr A Guillon,

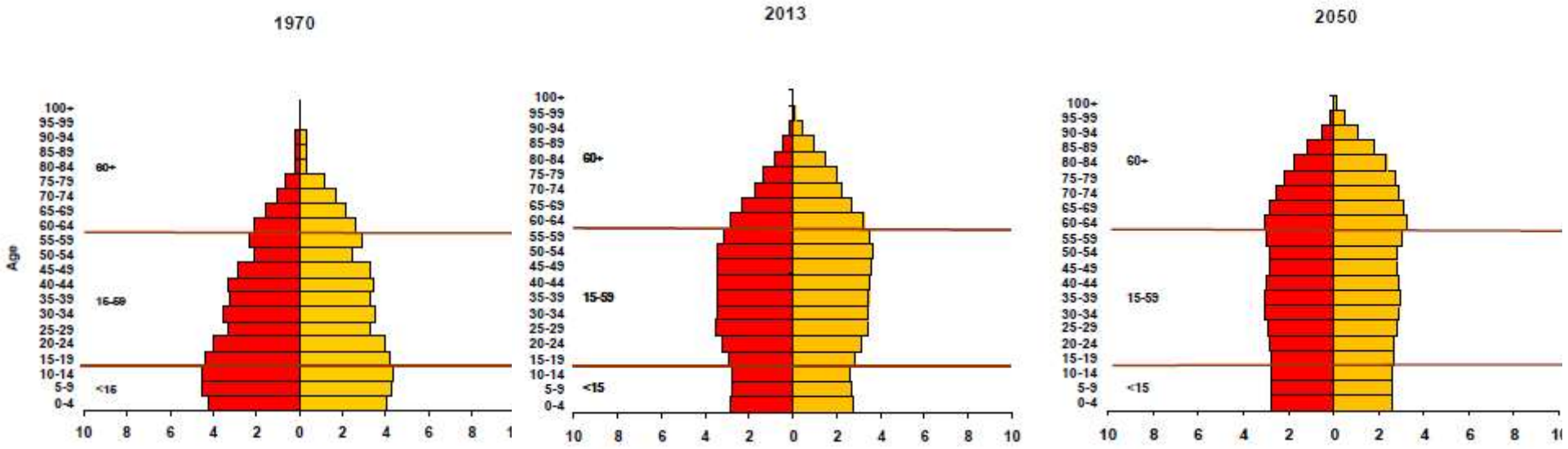
Service de Médecine Intensive -Réanimation, CHRU Tours, Inserm u1100

Percentage of patients ≥ 65 y.o. in the world by area



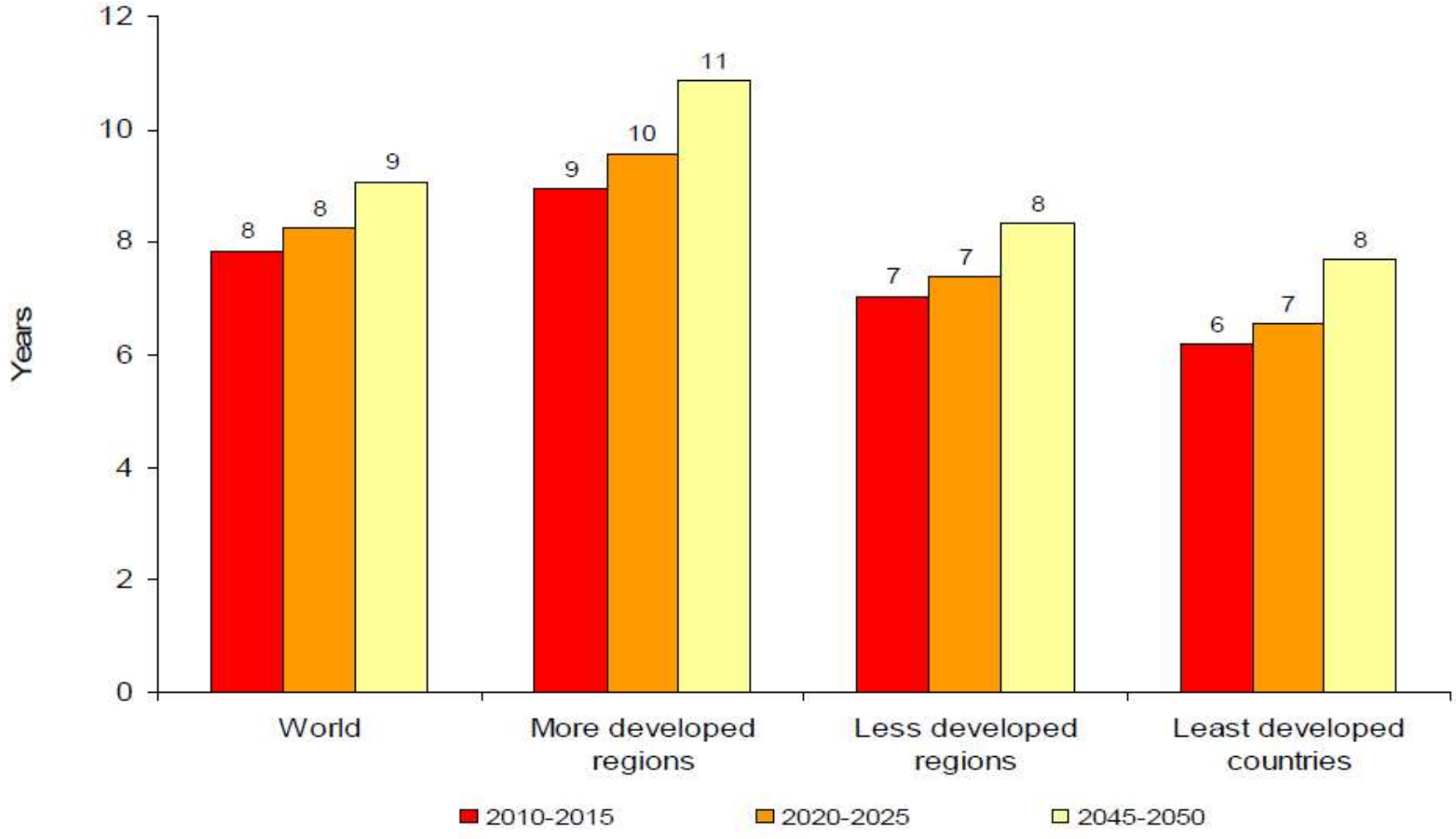
United Nations Population Division|Department of Economic and Social Affairs.

Population pyramids of developed regions: 1970, 2013 and 2050



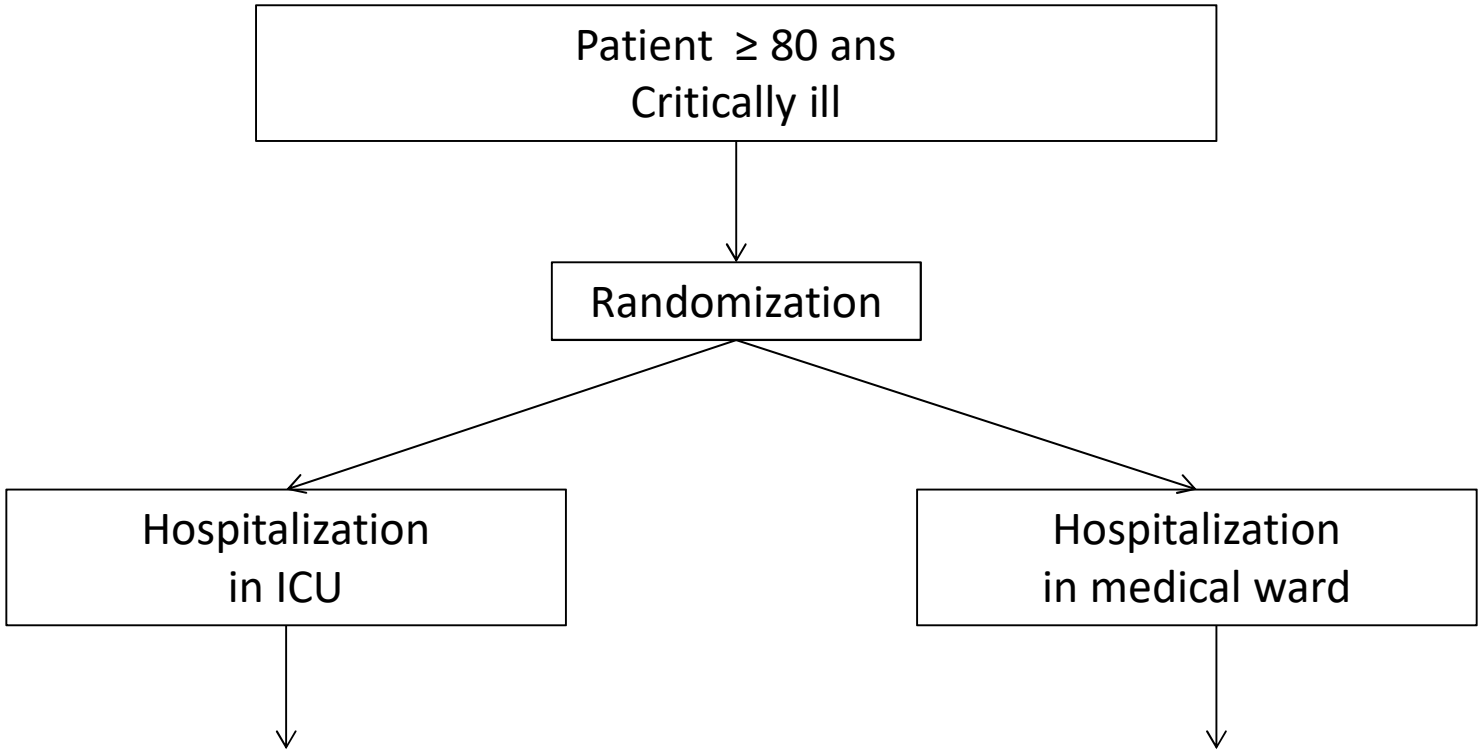
World Population Ageing 2013. (2017)

Life expectancy at ages 80: world and development regions, 2010-2015, 2020-2025 and 2045-2050



World Population Ageing 2013. (2017)

Will this elderly patient benefit from being admitted to the ICU?



Judgment criteria: mortality, long-term outcome, quality of life

JAMA | Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT 2017

Effect of Systematic Intensive Care Unit Triage on Long-term Mortality Among Critically Ill Elderly Patients in France
A Randomized Clinical Trial

Bertrand Guidet, MD; Guillaume Leblanc, MD; Tabassome Simon, MD, PhD; Maguy Woimant, MD; Jean-Pierre Quenot, MD; Olivier Ganansia, MD; Maxime Maignan, MD; Youri Yordanov, MD; Samuel Delerme, MD; Benoit Doumenc, MD; Muriel Fartoukh, MD; Pierre Charestan, MD; Pauline Trognon, MD; Bertrand Galichon, MD; Nicolas Javaud, MD; Anabela Patzak, MD; Maïté Garrouste-Orgeas, MD; Caroline Thomas, MD; Sylvie Azerad, PharmD; Dominique Pateron, MD; Ariane Boumendil, PhD; for the ICE-CUB 2 Study Network

Multicenter, **cluster-randomized clinical trial** of 3037 **critically ill** elderly patients **75 years or older**, free of cancer, with preserved functional and nutritional status who arrived at the **emergency department**

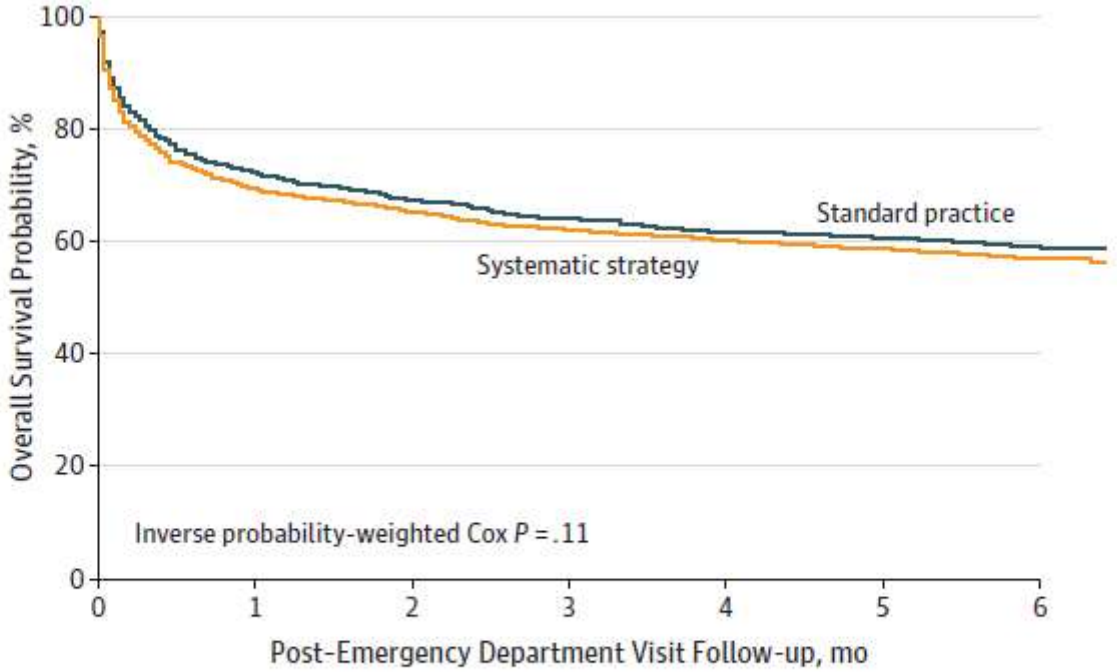
Systematic ICU admission of patients or to follow **standard practice**.

Patients in the systematic strategy group had an **increased ICU admission rate** (61% vs 34%; RR, 1.80; 95%CI,1.66-1.95)

JAMA | Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

Effect of Systematic Intensive Care Unit Triage on Long-term Mortality Among Critically Ill Elderly Patients in France

A Randomized Clinical Trial



No. at risk							
Standard practice	1518	1126	1042	992	961	941	912
Systematic strategy	1518	1029	966	919	887	860	826

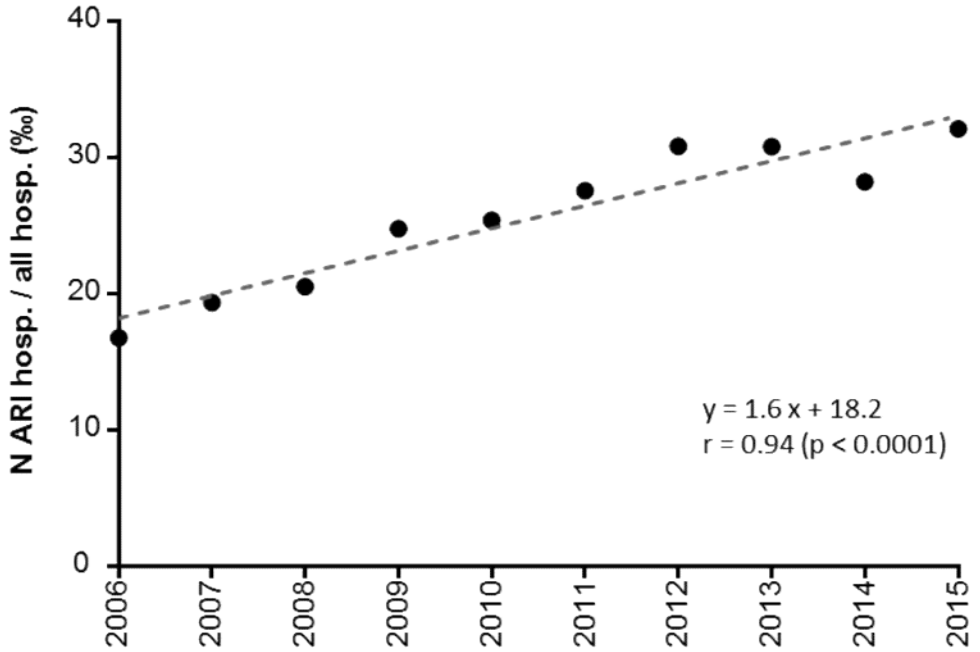
Among critically ill elderly patients in France, a program to promote systematic ICU admission increased ICU use but did not reduce 6-month mortality.

Will this elderly patient benefit from being admitted to the ICU?

80 y.o. , acute respiratory infection

Ten-year trends in intensive care admissions for respiratory infections in *Région Centre Val de Loire*

EpiDcli
Épidémiologie des Données cliniques

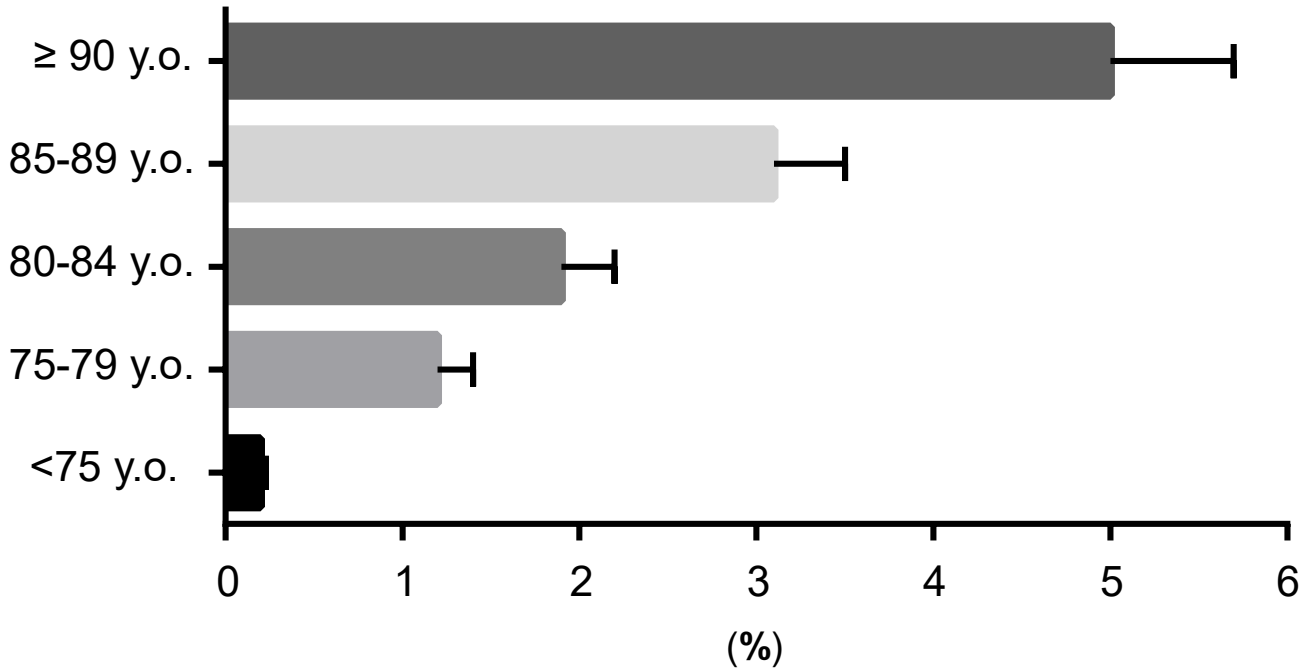


ARI hospitalizations	6751	7716	8089	9641	9841	10568	11744	11568	10567	11896
Overall hospitalizations	402270	398705	394108	389067	387411	383428	381091	375798	374354	370553

"we observed a substantial increase in acute respiratory infections diagnoses [...] with a growing demand for critical care services. [...] This work should guide physicians and healthcare administrators in their approach to policies concerning ICU admission and organisation"

Laporte L, Hermetet C, Jouan Y, Gaborit C, Rouve E, Shea KM, Si-Tahar M, Dequin PF, Grammatico-Guillon L, Guillon A. Ten-year trends in intensive care admissions for respiratory infections in the elderly. Ann Intensive Care (2018).

Annual incidence of hospitalization for acute respiratory infection (Région Centre Val de Loire)



Laporte L, Hermetet C, Jouan Y, Gaborit C, Rouve E, Shea KM, Si-Tahar M, Dequin PF, Grammatico-Guillon L, Guillon A. Ten-year trends in intensive care admissions for respiratory infections in the elderly. Ann Intensive Care (2018).

Is it more serious for a ≥ 80 y.o. person to be hospitalized for **hip fracture** or for acute **respiratory infection**?

hip fracture

Hospital mortality 5,4%

respiratory infection?

Hospital mortality 17,9%

Guillon A, Mizgerd J, Grammatico-Guillon L. Two-year survival among elderly hospitalized for pneumonia versus hip fracture: a useful comparison to raise awareness. European Respiratory Review, 2020.

2-year survival among elderly hospitalised for acute respiratory infection *versus* hip fracture: a useful comparison to raise awareness

Guillon A, Mizgerd J, Grammatico-Guillon L.

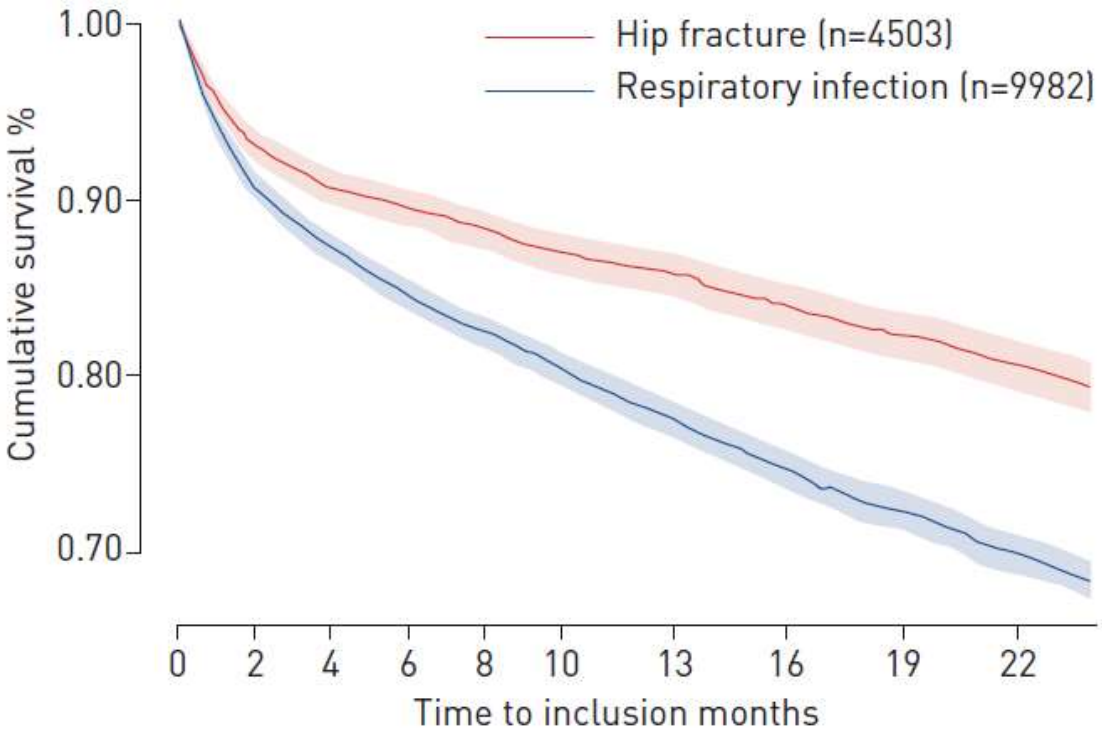


FIGURE 1 Kaplan–Meier curves showing the cumulative probabilities of survival at 2 years for elderly patients discharged from hospital after acute respiratory infection or hip fracture (log rank test p<0.0001).

@ERSpublications
If breaking a hip feels like a concern for the elderly, then getting pneumonia should be twice as concerning: patients hospitalised for lung infection had 3.3-fold greater in-hospital mortality and 1.8-fold increased risk of death at 2 years https://bit.ly/2Xqsrf6

Appel pour discuter du transfert en réanimation d'une patiente:

Madame X, 86 ans

Elle vit seule à son domicile, fait ses courses et son potager. Pas d'antécédent.

Elle présente depuis 2 jours une asthénie, une gène respiratoire, une toux « sale » et une douleur thoracique gauche.

Elle est consciente, orientée, 38.1 °C, PA 140/80 mmHg, FC 110/min, SpO2 : 88% au masque à haute concentration, FR 33 cycles/min, foyer de crépitant gauche.

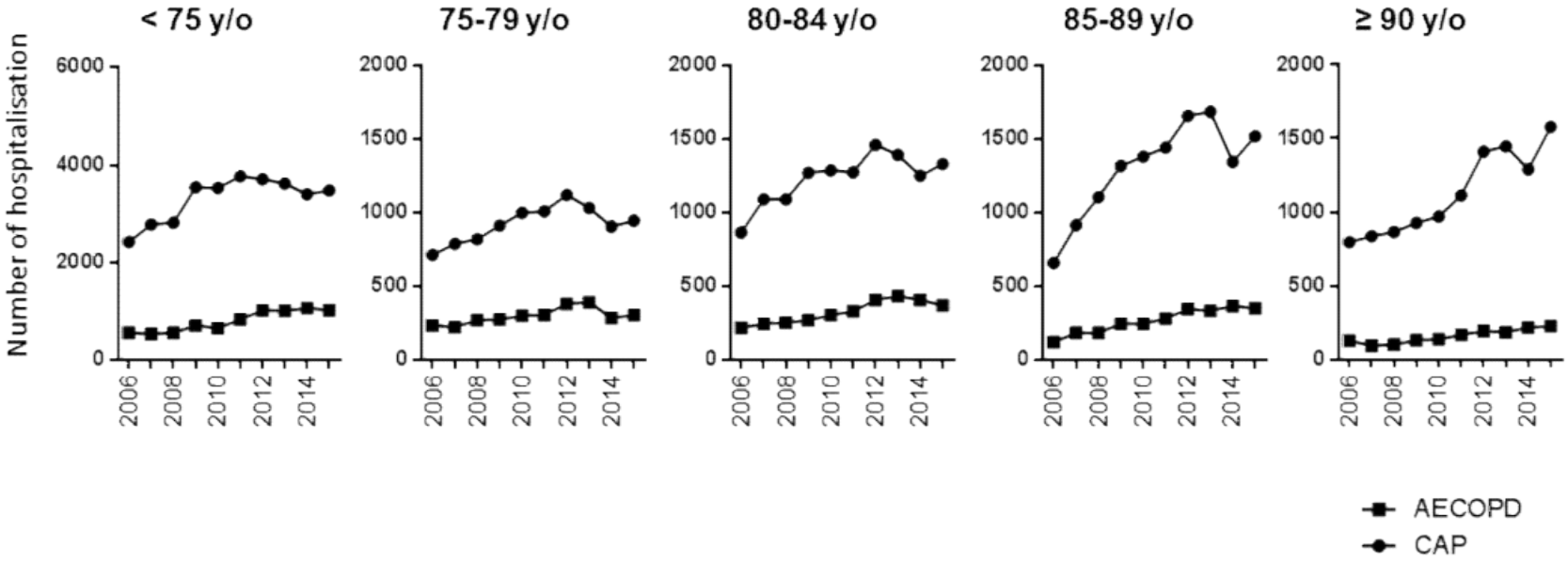
Hospitalisez-vous cette patiente en réanimation?

- ❑ Non, elle est trop âgée
- ❑ Oui, je vais la sauver
- ❑ Je ne sais pas

RESEARCH Open Access

Ten-year trends in intensive care admissions for respiratory infections in the elderly

Lucile Laporte[1,2], Coralie Hermetet[1,3,4], Youenn Jouan[1,2,5], Christophe Gaborit[3,4], Emmanuelle Rouve[2], Kimberly M. Shea[6], Mustapha Si-Tahar[1,5], Pierre-François Dequin[1,2,5], Leslie Grammatico-Guillon[1,3†] and Antoine Guillon[1,2,5*†]



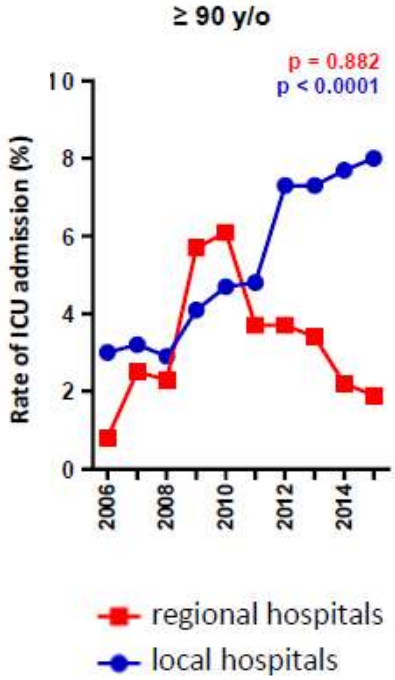
Laporte L, Hermetet C, Jouan Y, Gaborit C, Rouve E, Shea KM, Si-Tahar M, Dequin PF, Grammatico-Guillon L, Guillon A. Ten-year trends in intensive care admissions for respiratory infections in the elderly. Ann Intensive Care (2018).

Lucile

RESEARCH Open Access

Ten-year trends in intensive care admissions for respiratory infections in the elderly

Lucile Laporte[1,2], Coralie Hermetet[1,3,4], Youenn Jouan[1,2,5], Christophe Gaborit[3,4], Emmanuelle Rouve[2], Kimberly M. Shea[6], Mustapha Si-Tahar[1,5], Pierre-François Dequin[1,2,5], Leslie Grammatico-Guillon[1,3†] and Antoine Guillon[1,2,5*†]



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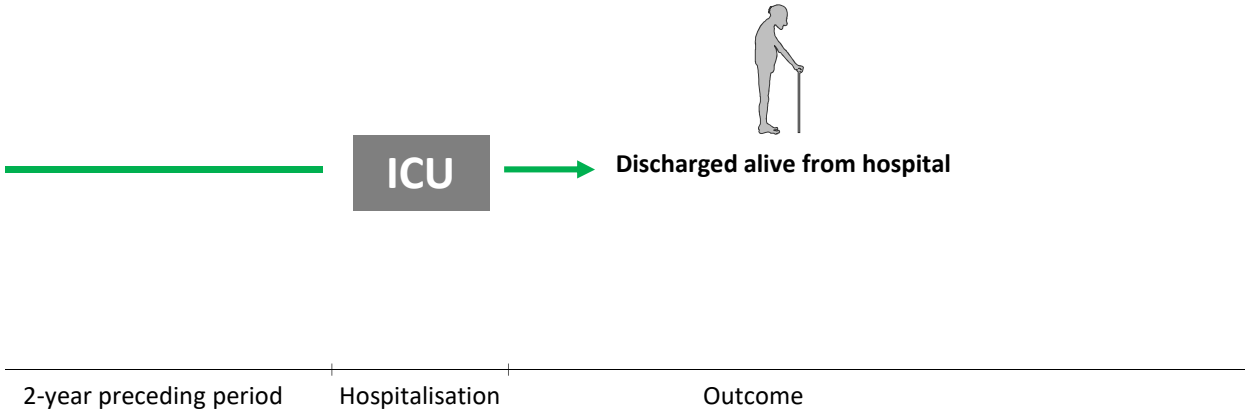
Coralie

RESEARCH Open Access

Long-term survival of elderly patients after intensive care unit admission for acute respiratory infection: a population-based, propensity score-matched cohort study

Antoine Guillon[1*], Coralie Hermetet[2,3], Kimberly A. Barker[4,5], Youenn Jouan[1], Christophe Gaborit[2,3], Stephan Ehrmann[1,6], Yannick Le Manach[7], Pierre-François Dequin[1] and Leslie Grammatico-Guillon[2]



Coralie

RESEARCH Open Access

Long-term survival of elderly patients after intensive care unit admission for acute respiratory infection: a population-based, propensity score-matched cohort study

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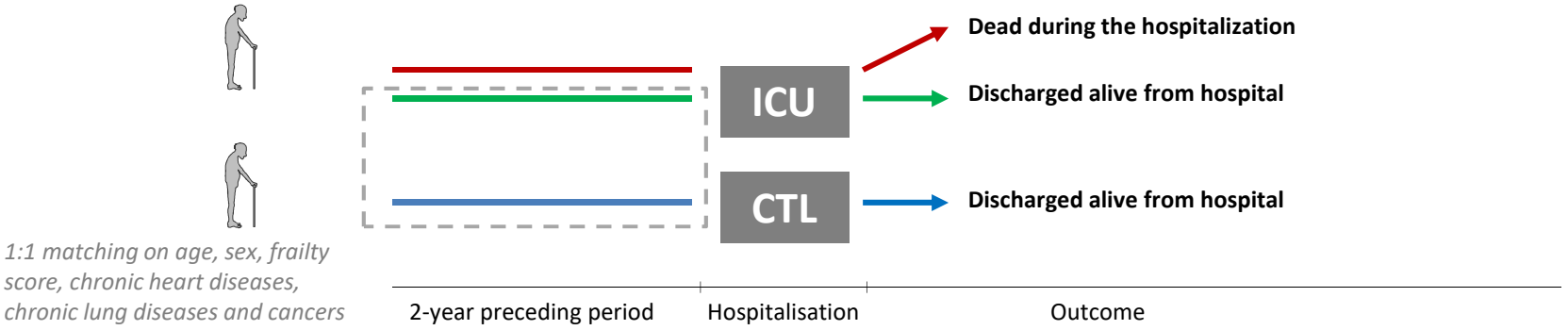
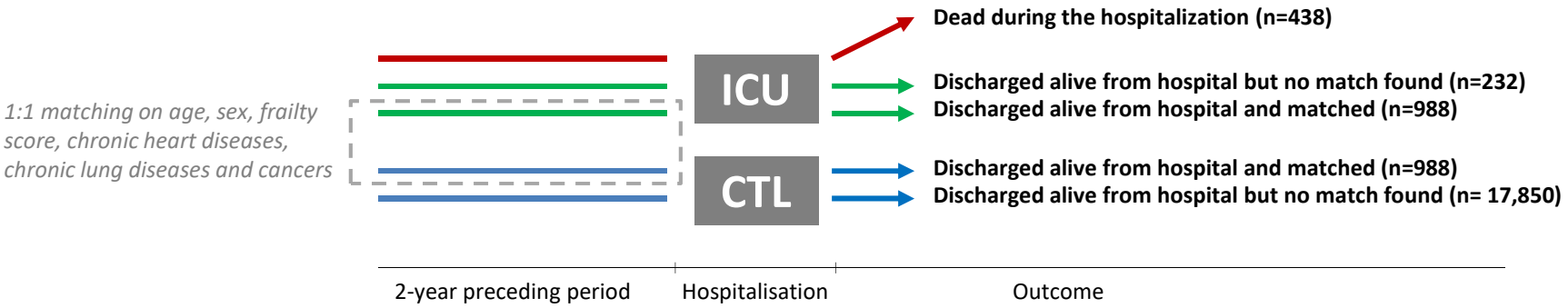


1:1 matching on age, sex, frailty score, chronic heart diseases, chronic lung diseases and cancers

Patient ≥ 80 y.o. hospitalized in ICU for acute respiratory infection.

What is the probability of survival after being discharged from the hospital?

A



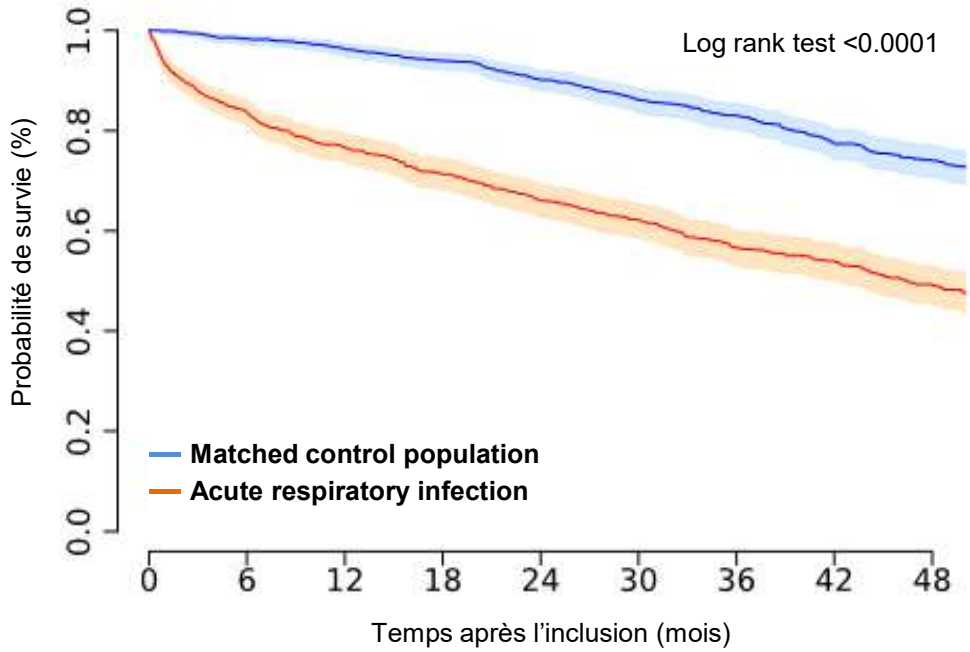
B

	Patients hospitalized in ICU for ARI and discharged alive from hospital	Control patients (surgery for cataract during the same period)	p-value
Number	988	988	
Age (years, mean +/- SD)	85.1 +/- 4.1	85.0 +/- 3.8	0.805
Sex female (n, %)	494 (50.0)	483 (48.9)	0.653
Comorbidities (n, %)			
Chronic heart failure	336 (34.0)	341 (34.5)	0.850
Chronic pulmonary diseases	109 (11.0)	108 (10.9)	1.000
Cancer	91 (9.2)	97 (9.8)	0.701
Frailty score (mean +/- SD)	2.88 +/- 4.28	2.83 +/- 4.40	0.772

Patient ≥ 80 y.o. hospitalized in ICU for acute respiratory infection.

What is the probability of survival after being discharged from the hospital?

Coralie



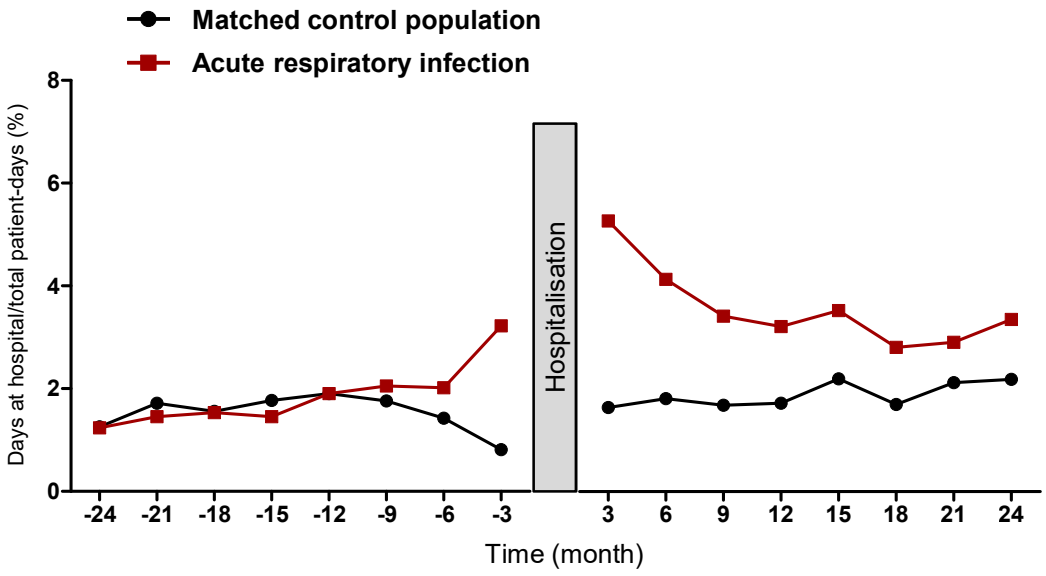
Matched control population:	**988**	**882**	**840**	**799**	**737**	**672**	**610**	**523**	**410**
Acute respiratory infection:	**988**	**699**	**607**	**540**	**471**	**423**	**352**	**306**	**239**

Guillon A, Hermetet C, Barker KA, Jouan Y, Gaborit C, Ehrmann S, Le Manach Y, Dequin PF, Grammatico-Guillon L. Long-term survival of elderly patients after intensive care unit admission for acute respiratory infection: a population-based, propensity-score matched cohort study. Critical Care (2020)

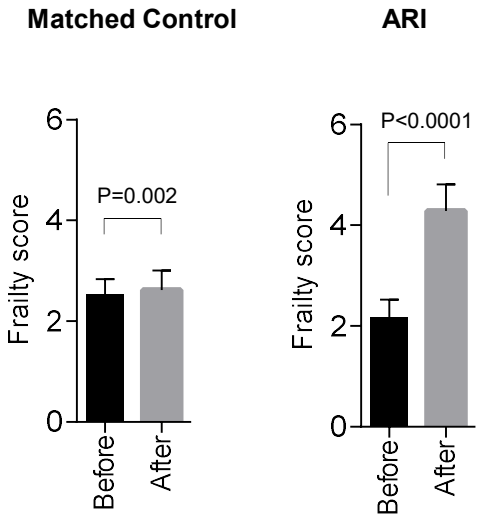
Patient ≥ 80 y.o. hospitalized in ICU for acute respiratory infection.

What is the "quality of life" after being discharged from the hospital?

Health care trajectoryies before/after



Frailty score before/after



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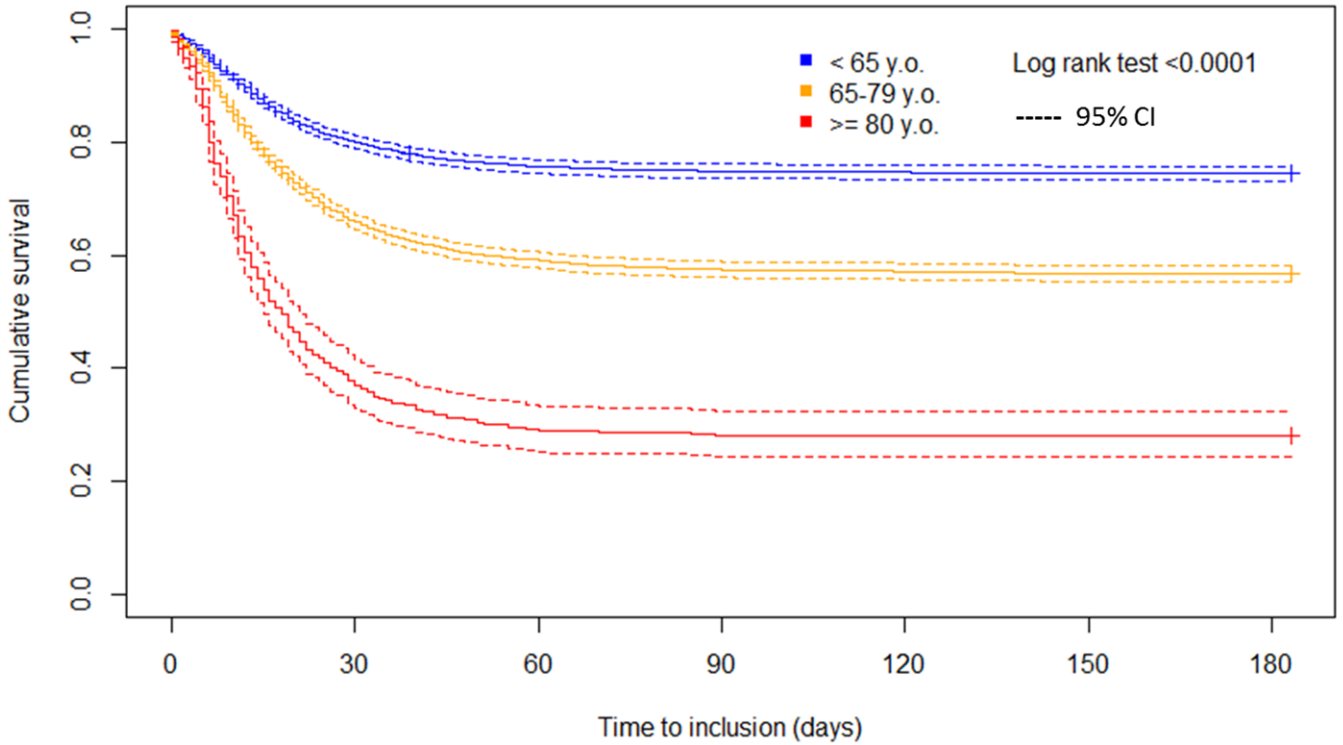
INTENSIVE CARE MEDICINE
THE OFFICIAL JOURNAL OF ESICM

Long-term mortality of elderly patients after intensive care unit admission for COVID-19

Antoine Guillon[1], Emeline Laurent[2,3], Lucile Godillon[2], Antoine Kimmoun[4] and Leslie Grammatico-Guillon[2,5*]

Fig 1. Kaplan-Meier curves showing the cumulative probabilities of survival.

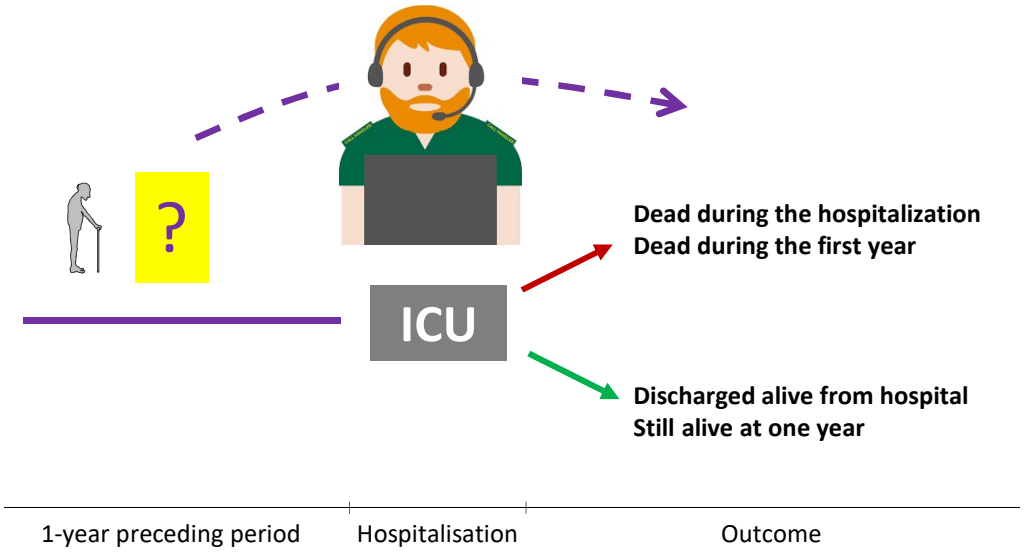


Will this elderly patient benefit from being admitted to the ICU?

Prediction of 1-year survival among elderly patients hospitalized in ICU for acute respiratory infection

Lionel

Arthur



Prediction of 1-year survival among elderly patients hospitalized in ICU for acute respiratory infection

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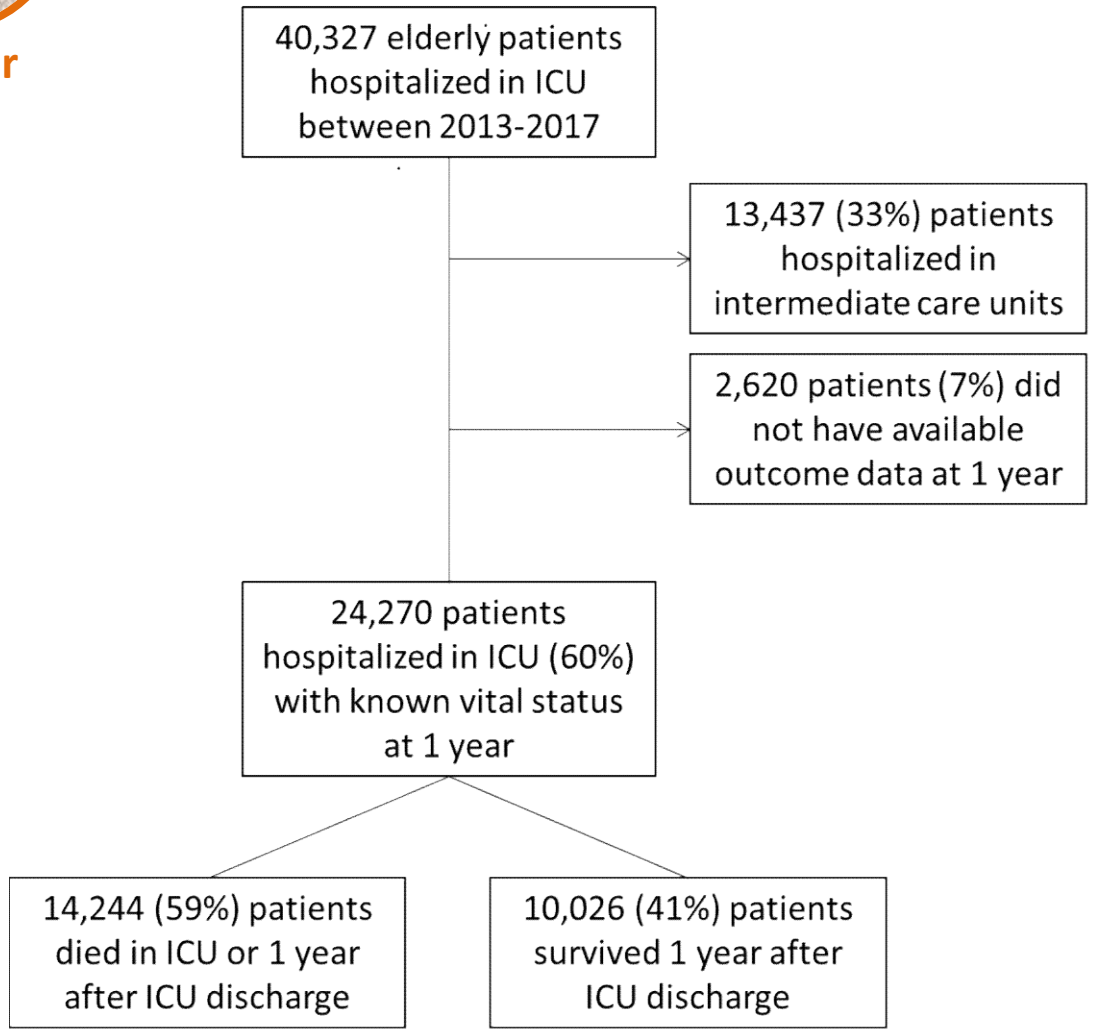

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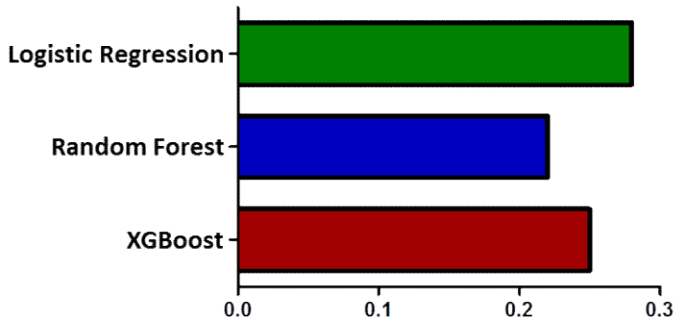
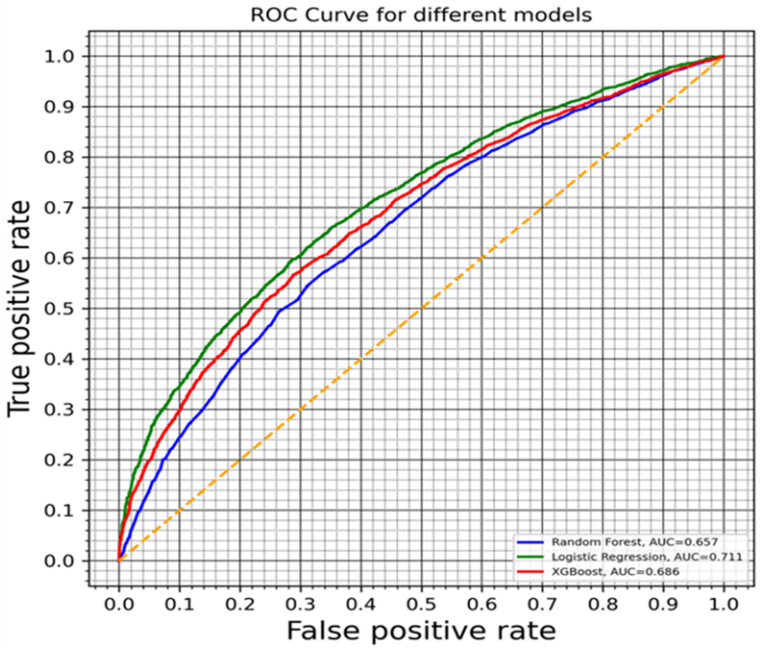


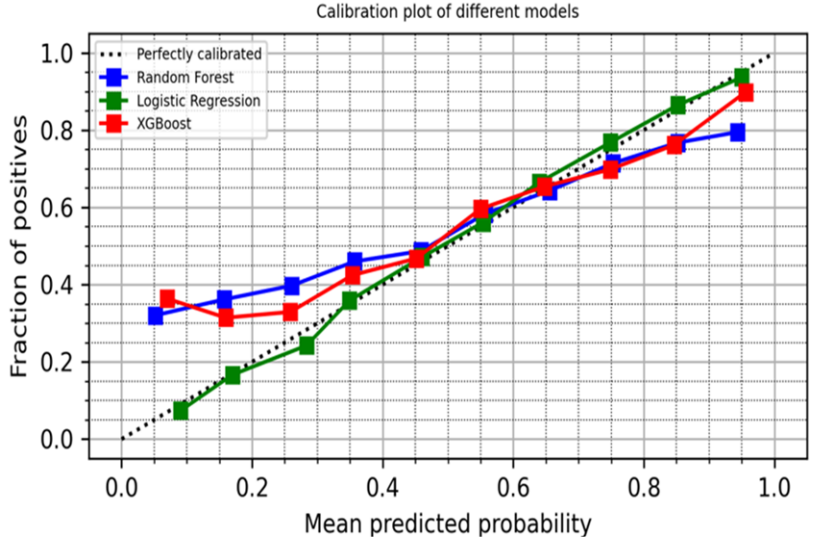
B



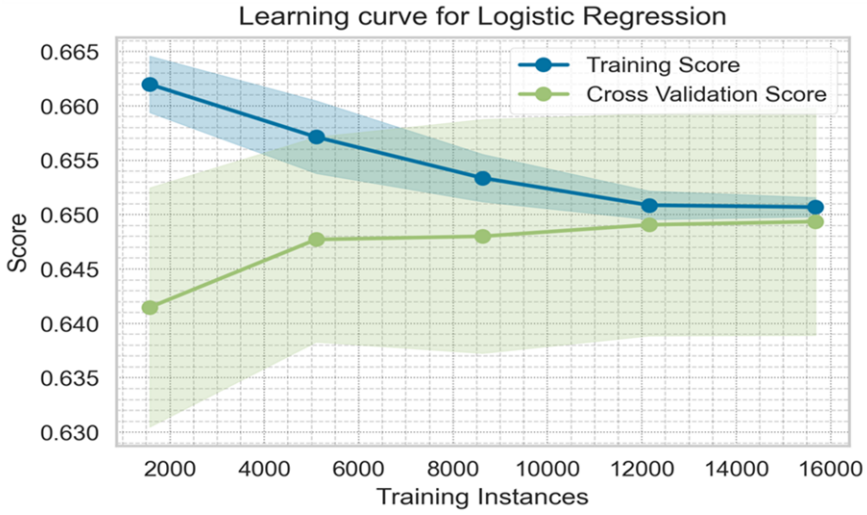
C

Models	AUROC	Accuracy	Specificity	Sensitivity
Logistic Regression	0.71	0.66	0.70	0.77
Random Forest	0.65	0.64	0.68	0.74
XGBoost	0.68	0.65	0.69	0.74

D



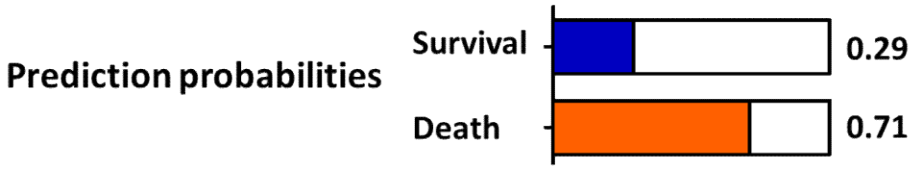
E



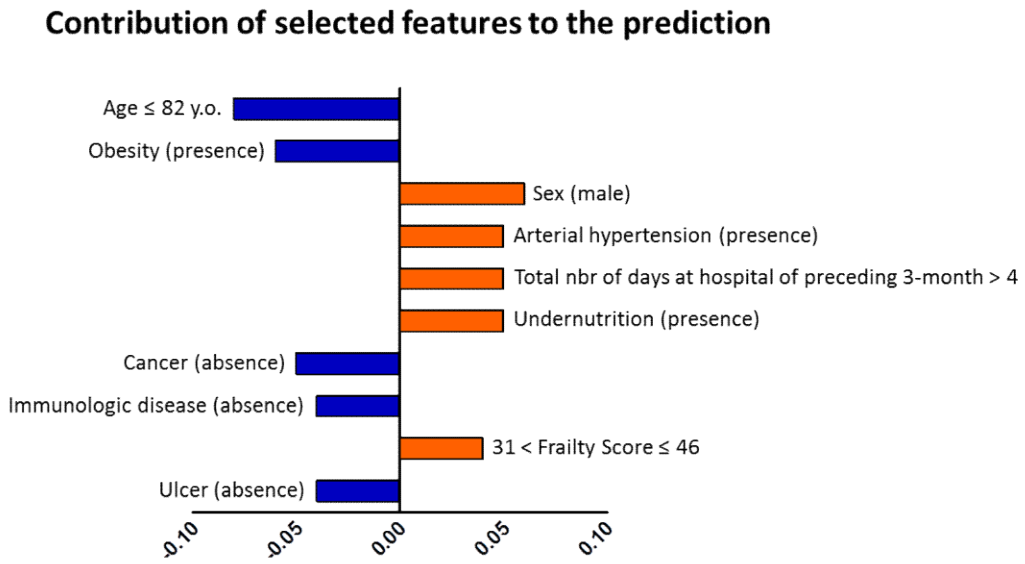
Prediction of 1-year survival among elderly patients hospitalized in ICU for acute respiratory infection

Arthur

Patient 1



Top ten features selected	Values
1. Age	82
2. Obesity	Yes
3. Sex	Male
4. Arterial hypertension	Yes
5. Total numbers of day at hospital during the preceding 3-month period	21
6. Undernutrition	Yes
7. Cancer	No
8. Immunological disease	No
9. Frailty score	33
10. Ulcer	No



Prediction of 1-year survival among elderly patients hospitalized in ICU for acute respiratory infection

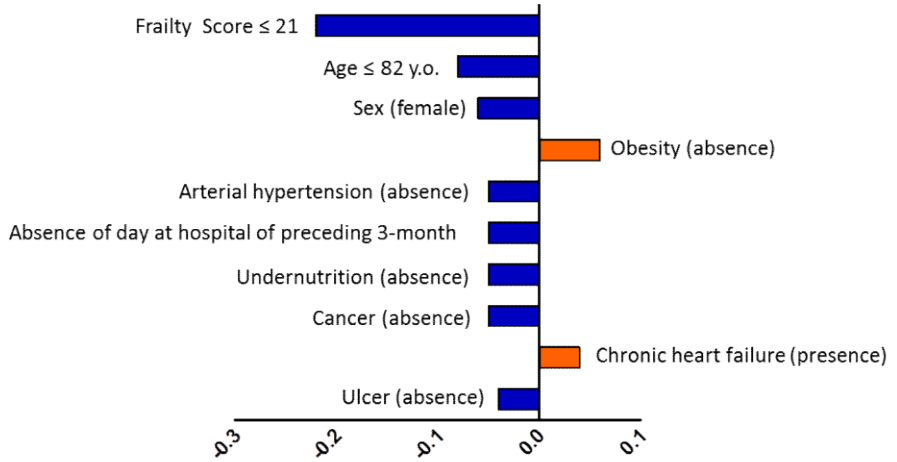
Arthur

Patient 2

Prediction probabilities

Top ten features selected	Values
1. Frailty Score	5
2. Age	80
3. Sex	Female
4. Obesity	No
5. Arterial hypertension	No
6. Total numbers of day at hospital during the preceding 3-month period	0
7. Undernutrition	No
8. Cancer	0
9. Chronic heart failure	Yes
10. Ulcer	No

Contribution of selected features to the prediction

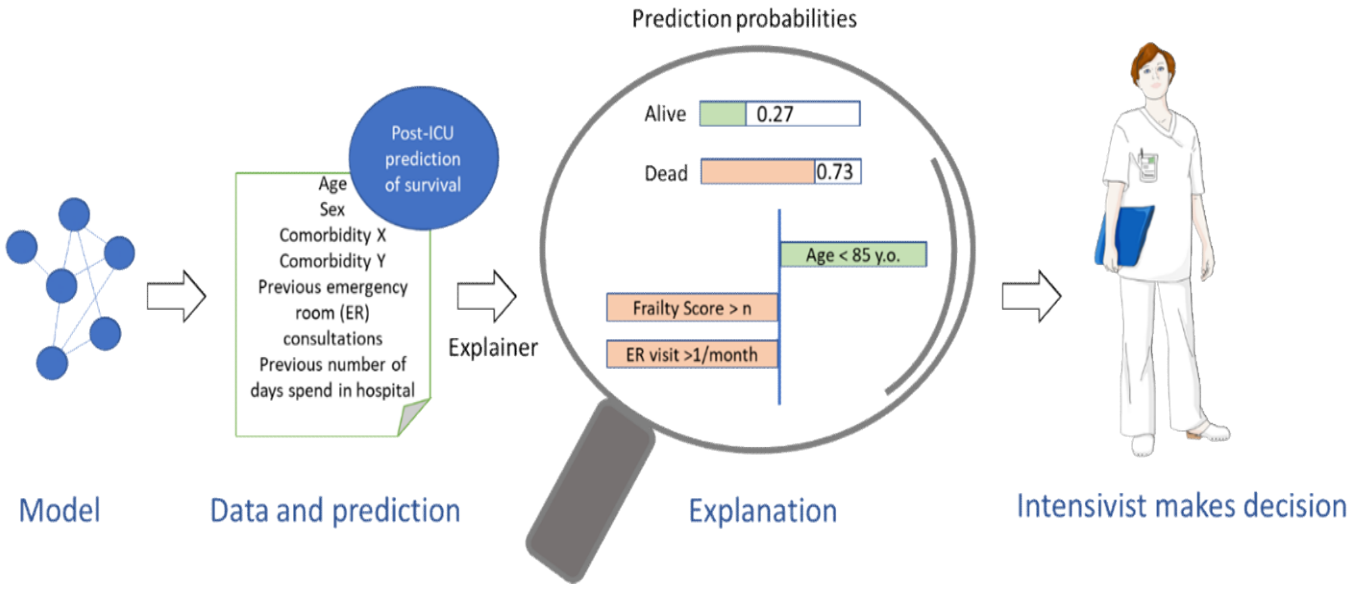


Inserm
La science pour la santé
From science to health

Appel à projets de recherche
MESSIDORE 2022

GENIALLY

Development of data-driven al**g**orithms to help the d**e**cisio**n**-making process of **I**CU **a**dmission of e**l**der**ly** patients with acute respiratory infection. *GENIALLY*



GENIALLY

WP-1. ***Data-driven algorithm to predict the survival of elderly with critical respiratory infection***

Leaders:

Team#1 : INSERM U1100, Centre d'Etude des Pathologies respiratoires (CEPR) Researchers expert in respiratory infection

Team#2 :Centre des Données Cliniques (CDC), CHRU Tours
Epidemiologists expert in healthcare databases

+ Participants : Team#3, Team#7

WP-2. ***To build an operational algorithm for a human decision-maker***

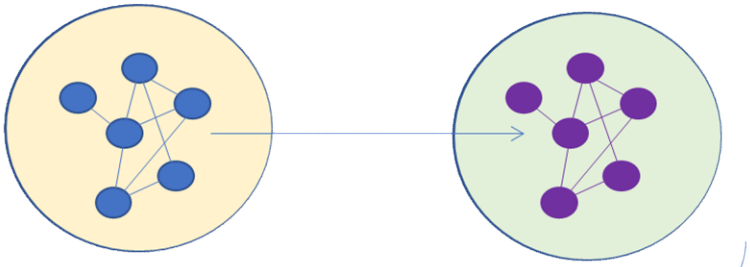
Leaders:

Team #3 : INSERM U1099, Laboratoire Traitement du Signal et de l'Image (LTSI)
Mathematicians/Statisticians expert in healthcare prediction models

Team #8: Ouest data hub

+ Participants: Team#1,#2, #7

MODEL GENERATION
[National cohort - Système National des Données de Santé]



MODEL IMPLEMENTATION
[Regional cohort –Ouest Data Hub]

WP-3. ***Being a human first and a scientist in second***

Leaders:

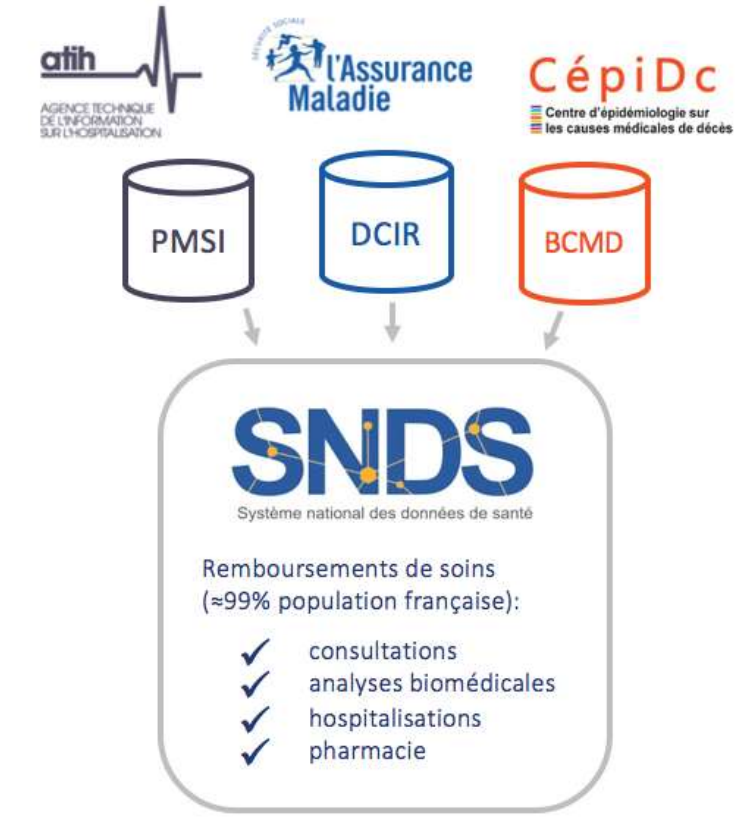
Team#4: Espace de Réflexion Ethique de la Région Centre-Val de Loire (ERERC)
Experts in bioethical with pluridisciplinary backgrounds

Team#5: Unité d'Évaluation Médico-Économique (UEME), CHRU Tours
Experts in econometric modeling of health care costs and expenditures

+ Participants: Team#1, Team#2, Team#3, Team#6, Team#7

Team#6 : Service de Médecine Intensive – Réanimation, CHRU Tours. Intensivists with experiences in medical ethic
Team#7 : Service de Médecine Intensive – Réanimation, CHRU Nancy. Intensivists with experience in bigdata

SNDS



OUEST DATA HUB

6 hôpitaux, rassemblant les données de 9.3 millions de patients et 11 millions de séjours, pour 2.5 milliards de données structurées.

Conclusion

Will this elderly patient benefit from being admitted to the ICU?

≥ 80 y.o
with respiratory infection

25% death during the hospital stay

Survivors: **20% death during the first year,**
2-fold decrease of quality of live surogates

Mediane survival time : 3 month

Conclusion

Hospitalisez-vous cette patiente en réanimation?

- ❑ Non, elle est trop âgée
- ❑ Oui, je vais la sauver
- ❑ Je ne sais pas

Merci de votre attention

If you think research is expensive, try disease!
Mary Lasker

Inserm
La science pour la santé
From science to health

OUEST DATA HUB

6 hôpitaux, rassemblant les données de 9.3 millions de patients et 11 millions de séjours, pour 2.5 milliards de données structurées.

Le premier réseau européen big data en santé!

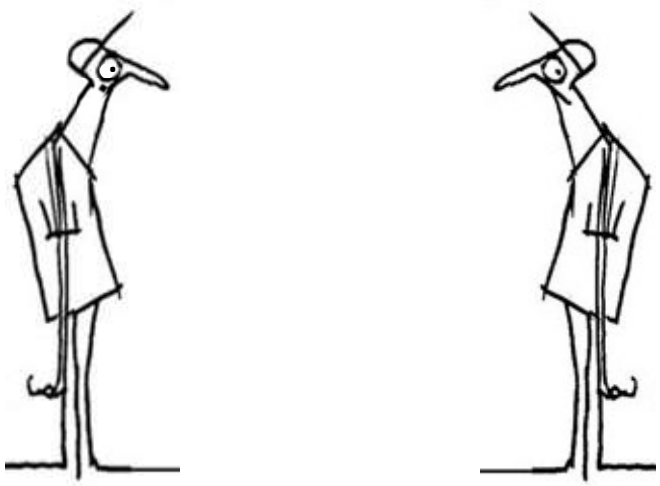
- Ca va pas? T’ as pas l’ air en forme!?

- Non, je viens de perdre mon oncle...

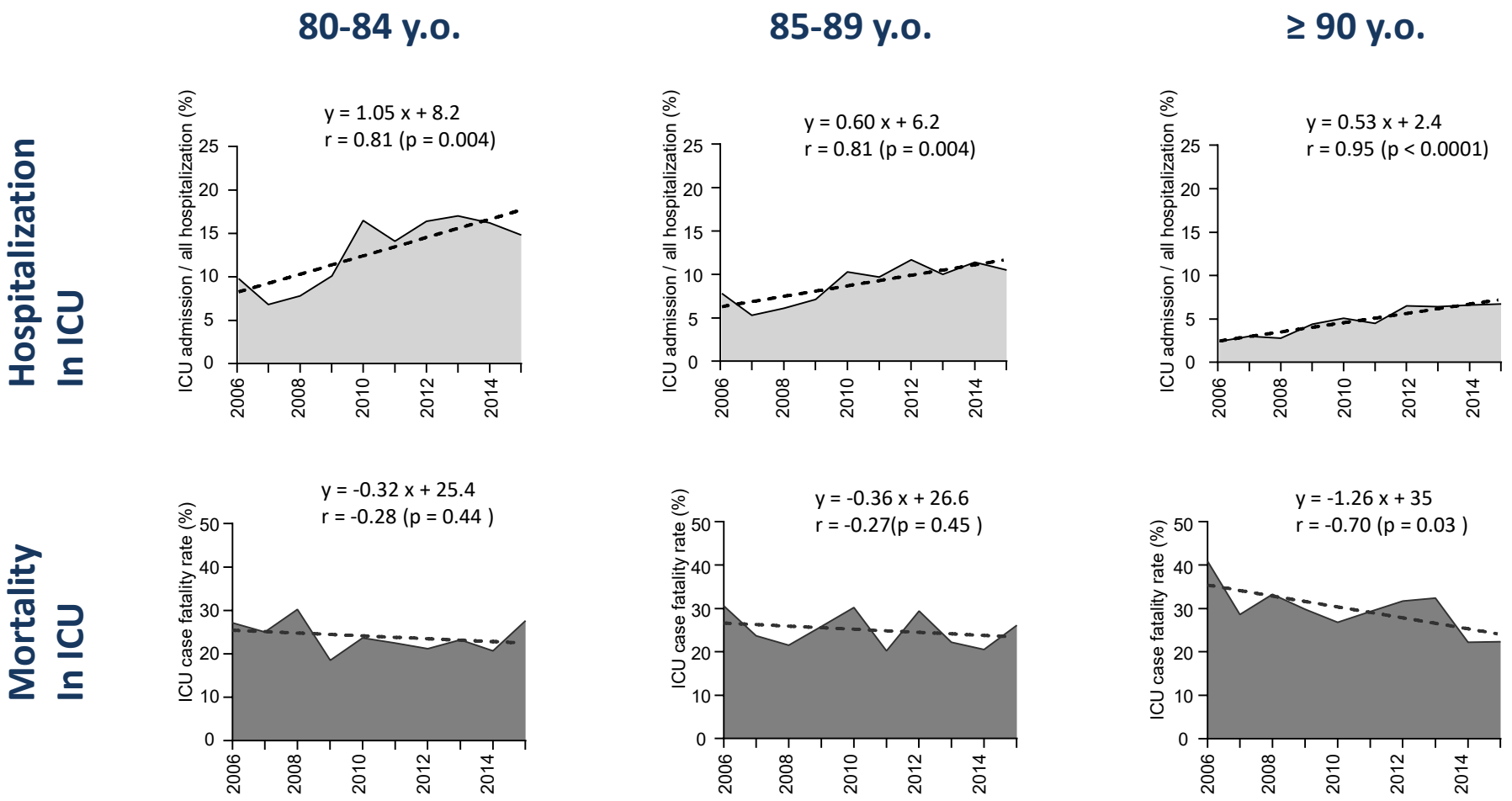
- Oh, mince. Il est mort de quoi?

- De la grippe

- Ah, de la grippe... heureusement c’ est pas grave.



Ten-year trends in ICU admissions for respiratory infections



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