30/03/2022

GETTING IT RIGHT FIRST TIME

DiRAC

High-Volume Low-Complexity Post-Procedural Complications

William Gray
Katie Tucker
Andrew Wheeler
Sue Eve-Jones
Maria Marcha
Johannes Heyl
Adrian Hopper
Flavien Hardy
Jeremy Yates

To what extent is **30-day readmission** a relevant variable to characterise post-procedural complications for HV-LC procedures?

Dataset:

- 49,465 patients discharged between 2014-04-01 and 2019-03-31
- Undergoing **endoscopic sinus surgery**
- Subsequent readmission within 90 days of discharge

Readmitted within 30 days: 1,163 patients (2.3%)
Readmitted within 90 days: 1,775 patients (3.6 %)

Coding for Likely Post-Procedural Complications

We used the **diagnostic codes** to identify spells that likely correspond to issues related to the procedure:

- Separate patients with and without a hospital readmission
- Count the number of spells that mention each ICD-10 code
- Compare the probability of use for each ICD-10 code
- Determine the codes that are more likely to be used for patients with readmissions and related to complications.

These *complication codes* include:

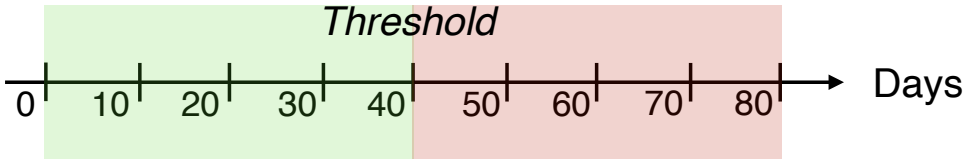
Y83	Surgical operation and other surgical procedures as the cause of abnormal reaction of the patient, or of later complication, without mention of misadventure at the time of the procedure
R04	Haemorrhage from respiratory passages
T81	Complications of procedures, not elsewhere classified

We considered that a spell was likely to be related to post-procedural complications if they mention at least one **complication code**, in **either the index or readmission spell**.

Complication Codes and Readmission Time

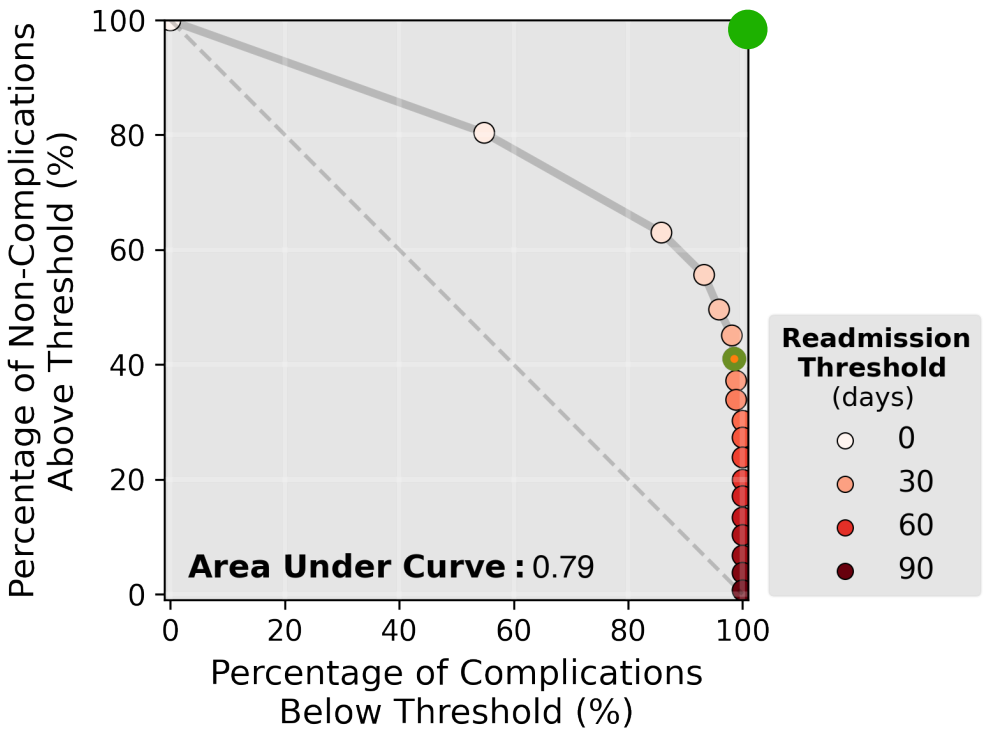
Is there an *optimum* readmission time that leads to both

- Including as many spells related to post-procedural complications as possible
- Excluding as many unrelated spells as possible?



Proportion of spells **with** complications?

Proportion of spells **without** complications?



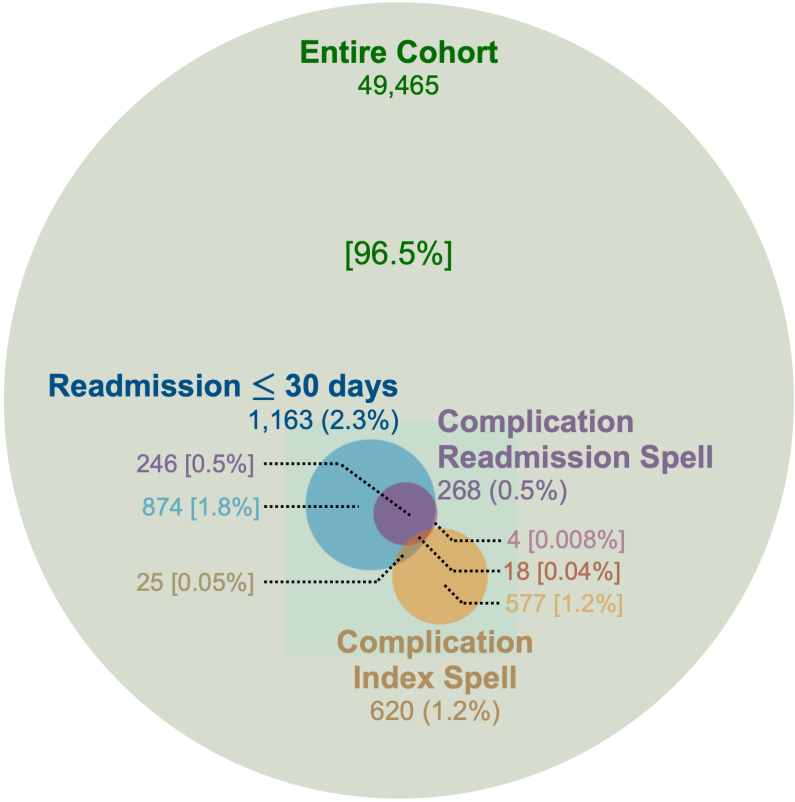
'Ideal' situation: perfect separation of spells with / without complications, with no overlap.
AUC = 1

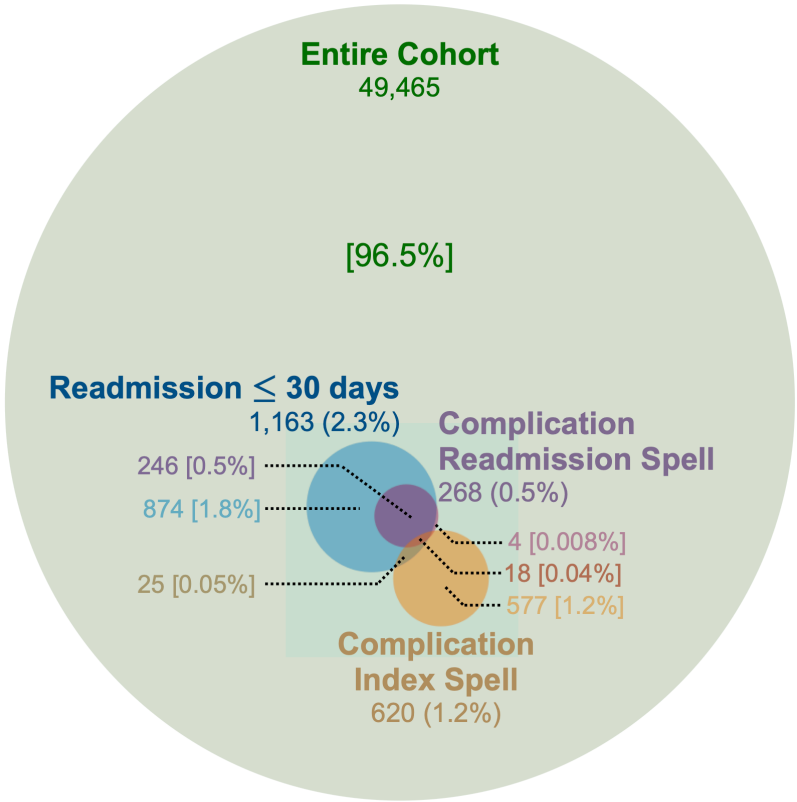
'Worst' situation: same distributions of spells with / without complications across time.
AUC = 0.5

Intermediate situation: The closer the AUC is to 1, the better the separation.

For the endoscopic sinus surgery dataset, the AUC = 0.79, which seems to show that:

- a good separation between spells with/without complications is possible.
- the preliminary analysis of ICD-10 codes to identify complications was relevant
- Thresholds between 15-30 day readmissions seem to be good options; 30 day readmissions include almost all readmission spells with complication codes:





Some advantages of the approach:

- The characterisation of complication spells is translated into a quantitative geometrical criterion.
- It is procedure-specific: another procedure might be associated with different complications, that may occur on other timescales.
- It can be useful for machine learning models, where we might accept being more 'lenient' in order to have a larger targeted population.

Some drawbacks of the approach:

- It is entirely dependent on the ICD-10 codes used to identify spells likely to be associated to post-procedural complications.
- It only accounts for readmission spells; it does not include single admissions that mention a complication code.

A machine learning model might prove useful, with the development of model that uses a specific population to potentially 'learn' the characteristics of the spells associated to post-procedural complications.