

Effects of Process Changes on Emergency Department Crowding in a Changing World

An Interrupted Time-Series Analysis

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OBJECTIVE:

To evaluate the effects of various process changes on emergency department (ED) crowding while taking into account:

- changing external circumstances, such as the Covid-19 pandemic and centralization of acute care.
- patient and visit characteristics.

METHODS:

- Six-year period: August 2014 – July 2020.
- Interrupted time-series analysis, ARIMA models.
- Outcomes:
 - Mean length of stay
 - Number of exit blocks
 - Mean NEDOCS

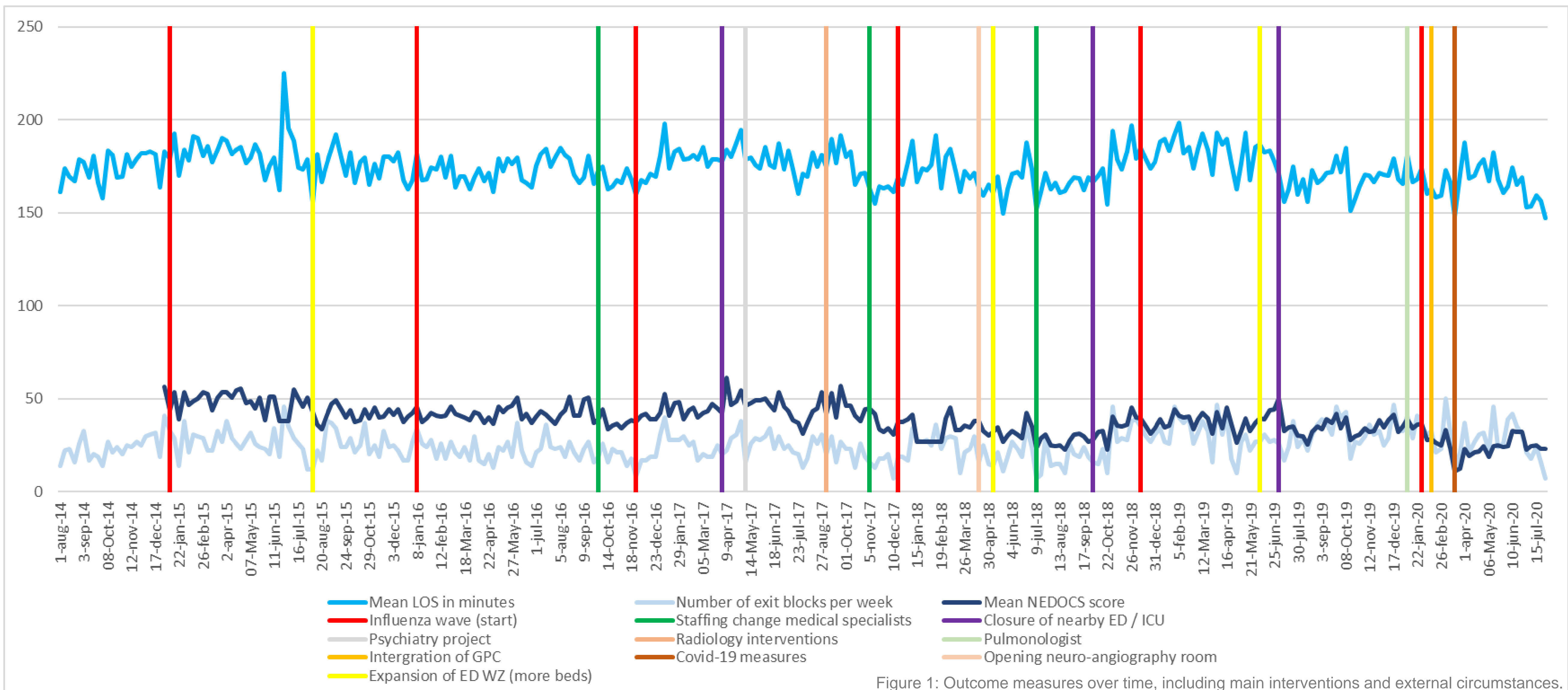


Figure 1: Outcome measures over time, including main interventions and external circumstances.

RESULTS:

Interventions:

- LOS decreased with the expansion of the ED to 26 beds.
- NEDOCS decreased with the integration of the general practitioner cooperative (GPC) and the expansion of the ED to 34 beds.
- NEDOCS increased with the closure of a neighbouring ED.
- Exit block increased with the closure of a neighbouring ICU.

External circumstances:

- The severe influenza wave of 2018-2019 was associated with increased LOS and exit block.

Patient and visit attributes:

- Longer LOS with more inpatient admissions, more urgent patients, and patients with extremity problems. Shorter LOS during daytime and with more patients with back pain, ear, nose throat or eye problems, or “other” presenting problems (rest category).
- More exit block with more inpatient admissions, more shortness of breath and more patients >70 years of age. Less exit block during daytime and with more “unwell” patients.
- Decreased NEDOCS with integration of the GPC and with expansion of the ED to 34 beds.

Mean LOS, ARIMA (0,1,1), stationary R-squared 0.560				
		Estimate	SE	Significance
LOS	MA Lag 1	0.793	0.37	<0.001
Interventions				
Expansion of the ED to 26 beds	Numerator Lag 0	-16.078	6.297	0.011
	Denominator Lag 1	-0.685	0.261	0.009
External circumstances				
Influenza 2018-2019	Numerator Lag 0	8.222	3.373	0.015
Patient and visit attributes				
Admission	Numerator Lag 0	0.187	0.26	<0.001
	Denominator Lag 1	0.375	0.108	<0.001
Back pain	Numerator Lag 0	-0.363	0.125	0.004
Ear, nose, throat and eye problems	Numerator Lag 0	-0.347	0.094	<0.001
Extremity problems	Numerator Lag 0	0.043	0.021	0.045
Other presenting problems	Numerator Lag 0	-0.124	0.048	0.010
Urgent (yellow / orange triage category)	Numerator Lag 0	0.058	0.029	0.044
Daytime	Numerator Lag 0	-0.061	0.018	<0.001

Table 1: ARIMA model specification for outcome measure “mean length of stay”.

TAKE HOME:

In the ongoing battle against ED crowding, it is pivotal to understand the effects of interventions, corrected for changing circumstances and patient / visit characteristics. In our ED, interventions which were associated with decreased crowding measures included expansion of the ED (more beds) and integration of the GPC on the ED.