Addressing ED Overcrowding: Experience with throughput interventions.

Brian H. Rowe, MD, MSc, CCFP(EM), FCCP
Tier I Canada Research Chair
Professor, Department of Emergency Medicine
University of Alberta

E2E Webinar
January 27, 2015
Disclosures

• I have no real, perceived or imagined COIs.
• Like all good Canadians, most of the “evidence” presented comes from self-citation and citation of friends.
• Please consider coming to CAEP-2015!
Outline

• Overcrowding background.
• Consequences of overcrowding.
• Interventions to mitigate crowding:
  – The evidence;
  – Examples of trials and systematic reviews.
• Lessons learned.
• Summary.
Conclusions

• ED overcrowding increases the morbidity and mortality of patients in the ED.

• The conceptual model for ED overcrowding involves *input-throughput-output* factors.

• Interventions to mitigate crowding involve *input, throughput, output* and/or *system-wide* solutions.

• Implementation of solutions requires careful attention to quantitative and qualitative outcomes and the hospital system.

• A system-wide strategy is worth it…I think!
Public reality in most urban EDs!
Definitions

• ED Overcrowding occurs when:
  – the demand for emergency services exceeds the ability of an emergency department to provide quality care within appropriate time frames.
  – NENA and CAEP Statement

• The problem has been described since the 1980s; primary issue EIPs.

• Little attention paid to it in Canada, and elsewhere until the late 1990s or early 2000s.
Conceptual Model

INPUT
- Referrals
- Ambulances
- Walk-ins

THROUGHPUT
- Triage
- Diagnosis
- Treatment

OUTPUT
- LWBS/LAMA
- Discharge
- Admit

SYSTEM-WIDE INFLUENCES

Adapted from Asplin and Fatovitch.
Why should we care?

After all, Canadian’s are used to waiting...
   For the post office...
For the economy in the US to recover...
   For the Stanley Cup to return....
Consequences

• Sub-standard medical care:
  – Delays in time-sensitive treatments (e.g., antibiotics for infections, thrombolytics for AMI, etc);
  – Outcomes:
    • Prolonged LOS;
    • Increased death (e.g., sepsis, AMI).

• Increased risks:
  – Medical errors;
  – Patient safety.
Consequences (continued)

• Infection Control:
  - ↑ risk of contagious illnesses.

• Human resources:
  - Decreased job satisfaction among nurses and physicians;
  - Increased sick time and absenteeism.

• Loss of privacy/dignity.

• Costs:
  - ↑ costs associated with ED overcrowding.
Consequences: how bad could it get?

Fig 2 | Adjusted odds ratios (95% confidence intervals) for death and admission to hospital within seven days of emergency department visit among all non-admitted (seen and discharged and left without being seen) low acuity patients (Canadian triage and acuity scale levels 4 to 5). Odds ratios adjusted for triage level, age group, sex, calendar month, income fifth, urban/rural community, No of visits to emergency department in previous year, chief complaint, time/day of shift.

ED overcrowding summary:

• It’s bad for patients, staff, and administrators.

• Most often affects:
  – Urban and large-volume EDs; trauma and referral centres; teaching centres.

• Main issue:
  – In-patients in the ED/system over-capacity.

• Efforts to mitigate ED overcrowding are worthwhile.
What are the potential solutions?

Evidence generation:
Knowledge synthesis and primary trials.
Return to the Conceptual Model

INPUT

Referrals
Ambulances
Walk-ins

THROUGHPUT

Triage
Diagnosis
Treatment

OUTPUT

LWBS/LAMA
Discharge
Admit

SYSTEM-WIDE INFLUENCES

Adapted from Asplin and Fatovitch.
Possible Solutions

• Overview commissioned by HQCA

• Rapid review methodology seeking HTA, SRs, and primary studies on selected interventions.

• Review reveals an extensive body of literature assessing interventions.
Pre-ED (input)

• Decreasing demand:
  – ED wait times reporting
  – Media campaigns;
  – Improved access to primary care;
  – Prevention (e.g., helmet laws) initiatives;
  – Chronic disease (e.g., COPD) management.

• Diversions of care:
  – Alternative sources (WIC, UCC) of care;
  – EMS:
    • Alternative destinations;
    • Ability to treat and discharge.
Pre-ED (input)

• Decreasing demand:
  – ED wait times reporting (??);
  – Media campaigns (-);
  – Improved access to primary care (??);
  – Prevention (e.g., helmet laws) initiatives (+);
  – Chronic disease (e.g., COPD) management (+).

• Diversions of care:
  – Alternative sources (WIC, UCC) of care (-);
  – EMS:
    • Alternative destinations (-);
    • Ability to treat and discharge (+).
Example #1:

- Reporting ED wait times (estimated time).
- Posting on AHS internet site (Calgary and Edmonton only).
- Presumes patients can accurately self-triage (counter evidence available).
In-ED (Throughput)

- Triage.
- Triage nurse ordering.
- Triage liaison physician.
- Enhanced diagnostics and access to results.
- Intermediate care: RAZ (+/-), Obs Units.
- EBM – care maps, eCPCGs, etc.
- Staffing levels, surge capacity.
- Engagement: Lean approach.
- Primary care (e.g., NPs) in the ED.
In-ED (Throughput)

- Triage (-).
- Triage nurse ordering (+/-).
- Triage liaison physician (+).
- Enhanced diagnostics and access to results (+).
- Intermediate care: RAZ (+/-), Obs Units (+/-).
- EBM – care maps, eCPGs, etc (+).
- Staffing levels, surge capacity (+/-).
- Engagement: Lean approach (+).
- Primary care (e.g., NPs) in the ED (-).
Example #2:

- Triage Liaison Physician (TLP).
- Novel intervention to deal with overflowing waiting rooms.
- Poor quality research and unclear benefit.
- Randomized controlled trial completed.

**PICO-D Research Question**

**P:** among adult patients at an urban, high-volume, trauma centre;

**I:** adding a **TLP** physician shift per day;

**C:** compared to the traditional physician shifts per day;

**O_1:** LOS (admitted/discharged)?

**O_2:** LWBS/LAMA, improve MD/nursing satisfaction?

**D:** un-blinded, parallel group, randomized, controlled trial.
Methods

• **Study period:** 8 week study period;
• **Allocation:** computerized, block-randomized sequences covering 8 weeks (2-week blocks).

**Control days:** usual emergency physician clinical shift schedule (7 X 8 hour shifts);

**Intervention days:** additional TLP shift physician (8 hours); funded by CHA.

**Data Collection:**
• Administrative data (PIA, LOS, LWBS, LAMA, patient volumes);
• Surveys issued pre-study and post-study.
# Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>TLP days (n = 2,841)</th>
<th>Control Days (n = 2,889)</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOS (mins) all cases, median (IQR)</td>
<td>4:21 (2:20, 8:36)</td>
<td>4:57 (2:38, 9:11)</td>
<td>36 minutes (p = 0.01)</td>
</tr>
<tr>
<td>LOS (mins) CTAS-3, median (IQR)</td>
<td>5:27 (2:56, 9:46)</td>
<td>6:06 (3:47, 10:45)</td>
<td>39 minutes (p = 0.01)</td>
</tr>
<tr>
<td>LWBS</td>
<td>6.3%</td>
<td>7.9%</td>
<td>p = 0.02</td>
</tr>
</tbody>
</table>
Summary

• Quantitative research:
  – Important effectiveness outcome end-points were achieved (MCID).

• Qualitative research:
  – MDs overwhelmingly favoured the shift;
  – Triage nurses felt supported by TLP;
  – Charge nurses felt flow was improved.

• Decision: continuation and expansion of the intervention was supported.
Example #3:

- Rapid Assessment Zone (RAZ).
- Novel intervention to assess patients from the waiting rooms.
- Poor quality research and unclear benefit.
- 6-week RCT completed using similar methods.

PICO-D Research Question

P: among adult patients at an urban, high-volume, trauma centre;

I: adding a RAZ unit model in one ED area;

C: compared to the traditional patient locations;

O₁: LOS (admitted/discharged)?

O₂: LWBS/LAMA, improve MD/nursing satisfaction?

D: un-blinded, parallel group, randomized, controlled trial.
## Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>RAZ days (n = 3,114)</th>
<th>Control Days (n = 3,103)</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOS mins (hrs) all cases</td>
<td>435 (7:15)</td>
<td>462 (7:42)</td>
<td>27 minutes (p = 0.014)</td>
</tr>
<tr>
<td>LOS mins (hrs) CTAS-3</td>
<td>544 (9:04)</td>
<td>561 (9:21)</td>
<td>15 minutes (p = 0.025)</td>
</tr>
<tr>
<td>LWBS</td>
<td>6.6%</td>
<td>7.1%</td>
<td>p = 0.43</td>
</tr>
</tbody>
</table>
Summary

• Quantitative research:
  – *Some* important effectiveness outcome endpoints were achieved (MCID).

• Qualitative research:
  – MDs overwhelmingly disliked the change;
  – Triage nurses felt TLP was distracted;
  – Charge nurses felt flow was unchanged.

• Decision: intervention was not continued.
Example #4:

- Volume-based staffing.
- Intervention to add additional shifts during periods of high volumes.
- Poor quality research and unclear benefit.
- Randomized controlled trial completed.

University of Alberta Hospital (UAH)

- University-based adult (55,000) and pediatric (35,000) tertiary care ED.
- Full-time, dedicated ED (CFPC-EM, ABEM, or FRCPC) staffing;
- High referral and ambulance traffic; 23% admission.
- Impressive overcrowding issues.
- Staffing model:
  - Static 8-hour shifts (weekday = weekends);
  - No “on-call” system; however, TTL funded;
  - Funded Triage Liaison Physician (TLP; 08-24:00) position;
  - Fast track, “pod system” (Acute vs non-acute), no RAZ;
  - Acute: 06, 12, 18, 24; Non-Acute: 9, 14, 19 (56 hrs/d).
ED visits over time

- University of Alberta Hospital ED pediatric/adult patient visits (4/01/2005 to 3/31/2012).

Data Source: HASS/EDIS 04/09/2012
Justification

• Rationale:
  – Among **throughput** interventions, volume-based staffing has been described infrequently.

• Study objective:
  – To evaluate the impact of adding an additional shift in a moderate case-complexity area of a typical urban, high-volume and academic centre with severe ED overcrowding.
PICO-D Research Question

P: among adult patients at an urban, high-volume, trauma centre;

I: adding a **fourth** physician shift per day in the ambulatory pod;

C: compared to the traditional **three** physician shifts per day in the ambulatory pod;

O₁: LOS (admitted/discharged)?

O₂: LWBS/LAMA, improve MD/nursing satisfaction?

D: un-blinded, parallel group, randomized, controlled trial.
Methods

• Study period: June 24 – Sep 15, 2011;
• Allocation: computerized, block-randomized sequences covering 12 weeks (2-week blocks).

Control days: usual emergency physician clinical shift schedule (09-17, 14-22, 19-03 hours);
Intervention days: additional ambulatory pod shift physician (09-17, 13-21, 17-01, 21-05 hours)

Data Collection:
• Surveys issued pre-study and post-study;
• Administrative data (PIA, LOS, LWBS, LAMA, patient volumes);
• Minimum clinically important difference (MCID).
Results – ED MCID

<table>
<thead>
<tr>
<th>Response rate 30/33 (91%)</th>
<th>Time to MD (mins)</th>
<th>EDLOSA (hours)</th>
<th>EDLOSD (hours)</th>
<th>LWBS (↓%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Clinically Important Difference</td>
<td>30 (20, 30)</td>
<td>1 (1, 2)</td>
<td>0.5 (0.5, 1)</td>
<td>25 (25, 50)</td>
</tr>
</tbody>
</table>

Emergency physicians were approached and asked to provide estimates of the minimally clinically important difference (MCID);

Benchmark provided: TLP study (↓ LOS by 30 minutes/patient; ↓ LWBS by 25%);

MCID described as” “the point where an intervention would be considered worth continuing irrespective of the cost of the intervention”.

Data are presented using numbers (%) and medians (IQR)
Results

- Over the three months prior to the study and during the study period, similar patient volumes and patient characteristics presented.

<table>
<thead>
<tr>
<th>Variable</th>
<th>3 months prior</th>
<th>3 months of study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visit Numbers</td>
<td>15,135</td>
<td>14,005</td>
</tr>
<tr>
<td>CTAS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,2</td>
<td>23.8%</td>
<td>22.5%</td>
</tr>
<tr>
<td>3</td>
<td>46.6%</td>
<td>46.4%</td>
</tr>
<tr>
<td>4,5</td>
<td>29.6%</td>
<td>31.1%</td>
</tr>
<tr>
<td>Median age (years; IQR)</td>
<td>46 (29, 63)</td>
<td>46 (28, 63)</td>
</tr>
<tr>
<td>Male sex (%)</td>
<td>51.8%</td>
<td>52.6%</td>
</tr>
<tr>
<td>Admission (%)</td>
<td>22.7%</td>
<td>22.9%</td>
</tr>
</tbody>
</table>

CTAS denotes Canadian Triage Acuity Scale; IQR= interquartile range.
## Results – PIA/LOS

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intervention days</th>
<th>Control days</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIA (mins) all cases, median (IQR)</td>
<td>69 (35, 123) (n = 6891)</td>
<td>76 (38, 138) (n = 7114)</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>LOS (hrs) admitted patients, median (IQR)</td>
<td>10.2 (6.5, 16.7) (n = 1554)</td>
<td>10.5 (6.4, 17.8) (n = 1664)</td>
<td>p = 0.27</td>
</tr>
<tr>
<td>LOS (hrs) discharged patients, median (IQR)</td>
<td>3.9 (2.3, 6.4) (n = 5337)</td>
<td>4.1 (2.3, 6.7) (n = 5450)</td>
<td>p = 0.06</td>
</tr>
</tbody>
</table>
Results – PIA/LOS

Multiple linear regression model:

• Adjustment for important confounders:
  • Age (increasing age increased LOS);
  • Sex (male sex ↑ LOS);
  • CTAS 3 (CTAS 3 ↑ LOS compared to CTAS 1,2),
  • CTAS 4,5 (CTAS 4,5 ↓ LOS compared to CTAS 1,2);
  • Consultations (consults ↑ LOS).

• Conclusion: The intervention provided a statistically significant influence on overall LOS (p=0.003).
# Results – LWBS/LAMA & Patient Volume

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intervention days</th>
<th>Control days</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LWBS rate (%)</td>
<td>3.7%</td>
<td>5.1%</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>LAMA rate (%)</td>
<td>0.5%</td>
<td>0.7%</td>
<td>p=0.084</td>
</tr>
</tbody>
</table>

**Physician patient volume:**

<table>
<thead>
<tr>
<th>Variable</th>
<th>All</th>
<th>Intervention days</th>
<th>Control days</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB pod MD</td>
<td>3391 (25.8%)</td>
<td>1694 (25.9%)</td>
<td>1697 (25.5%)</td>
</tr>
<tr>
<td>CDEF pod MD</td>
<td>9775 (74.2%)</td>
<td>4830 (74.0%)</td>
<td>4945 (74.4%)</td>
</tr>
<tr>
<td>Patients seen/physician in AB pod (Median, IQR)</td>
<td>15 (13, 19)</td>
<td>15 (12, 18)</td>
<td>16 (13, 20)</td>
</tr>
<tr>
<td>Patients seen/physician in CDEF pod (Median, IQR)</td>
<td>23 (20, 28)</td>
<td>22 (19, 24)</td>
<td>27 (23, 32)</td>
</tr>
</tbody>
</table>

*AB pod= acute pods; CDEF= ambulatory pods.*
Study Limitations

• One centre; while results are not be generalizable to other centres, the methodology could easily be applied elsewhere.

• No patient satisfaction data were collected (satisfaction is closely linked with wait times).

• Long-term follow-up and outcomes were not examined.

• Missing data points in the administrative databases (<20%).
Summary

• Quantitative research:
  – Important effectiveness outcome end-points were *not* achieved (MCID).

• Qualitative research:
  – MDs overwhelmingly liked the shift change;
  – Clinical nurses experienced less idle time;
  – Charge nurses felt flow was improved.

• Decision: Unanimous support for the continuation of the intervention.
Beyond the ED

- Rapid transfer to the floors (OCP/FCP).
- Increased bed availability:
  - Medical admission units = MAU;
  - Reducing length of stay (e.g., care paths, patient placement);
  - Planning electives/surgical smoothing.
- Discharge planning:
  - Ancillary staff;
  - AM discharge priority.
Beyond the ED

- Rapid transfer to the floors (OCP/FCP) (?).
- Increased bed availability:
  - Medical admission units = MAU (+/-);
  - Efforts to reduce length of stay (e.g., care paths, patient placement) (+);
  - Planning electives/surgical smoothing (+).
- Discharge planning:
  - Ancillary staff (+);
  - AM discharge priority (+).
System-wide solutions

• Pay for performance (not to individual MD/nurse) activities.
• Bench-marking (e.g., dashboards, reporting) of performance.
• Accountability (performance tied to employment) framework.
• System-wide initiatives.
System-wide solutions

- Pay for performance (not to individual MD/nurse) activities (+).
- Bench-marking (e.g., dashboards, reporting) of performance (+).
- Accountability (performance tied to employment/incentives) framework (+).
- System-wide initiatives (+/-).
Example #5: Canadian wait time targets

<table>
<thead>
<tr>
<th>Provinces</th>
<th>Admits (90\textsuperscript{th} percentile)</th>
<th>High Acuity Discharges (90\textsuperscript{th} percentile)</th>
<th>Low Acuity Discharges (90\textsuperscript{th} percentile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nova Scotia</td>
<td>8 hours</td>
<td>8 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Quebec</td>
<td>10 hours (mean)</td>
<td>8 hours (mean)*</td>
<td>only applies to stretcher patients</td>
</tr>
<tr>
<td>Ontario</td>
<td>8 hours (90\textsuperscript{th} percentile)</td>
<td>8 hours (90\textsuperscript{th} percentile)</td>
<td>4 hours (90\textsuperscript{th} percentile)</td>
</tr>
<tr>
<td>Manitoba</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alberta</td>
<td>8 hours (90\textsuperscript{th} percentile)</td>
<td>4 hours (75\textsuperscript{th} percentile)</td>
<td>2 hours (75\textsuperscript{th} percentile)</td>
</tr>
<tr>
<td>British Columbia</td>
<td>10 hours (75\textsuperscript{th} percentile)</td>
<td>4 hours (75\textsuperscript{th} percentile)</td>
<td>2 hours (75\textsuperscript{th} percentile)</td>
</tr>
</tbody>
</table>
Summary

• There are a variety of options available to address overcrowding (smorgasbord/buffet).
• Each hospital is unique and the strategy requires a bottom-up/lean approach.
• Courageous and dedicated senior leadership is clearly essential.
• Gains may be modest and iterative evaluation is critical.
Lets see if we....
….can avoid this!

"Want me to try to get you a private ward?"
Thanks for listening!

Questions for Julian?

brian.rowe@ualberta.ca