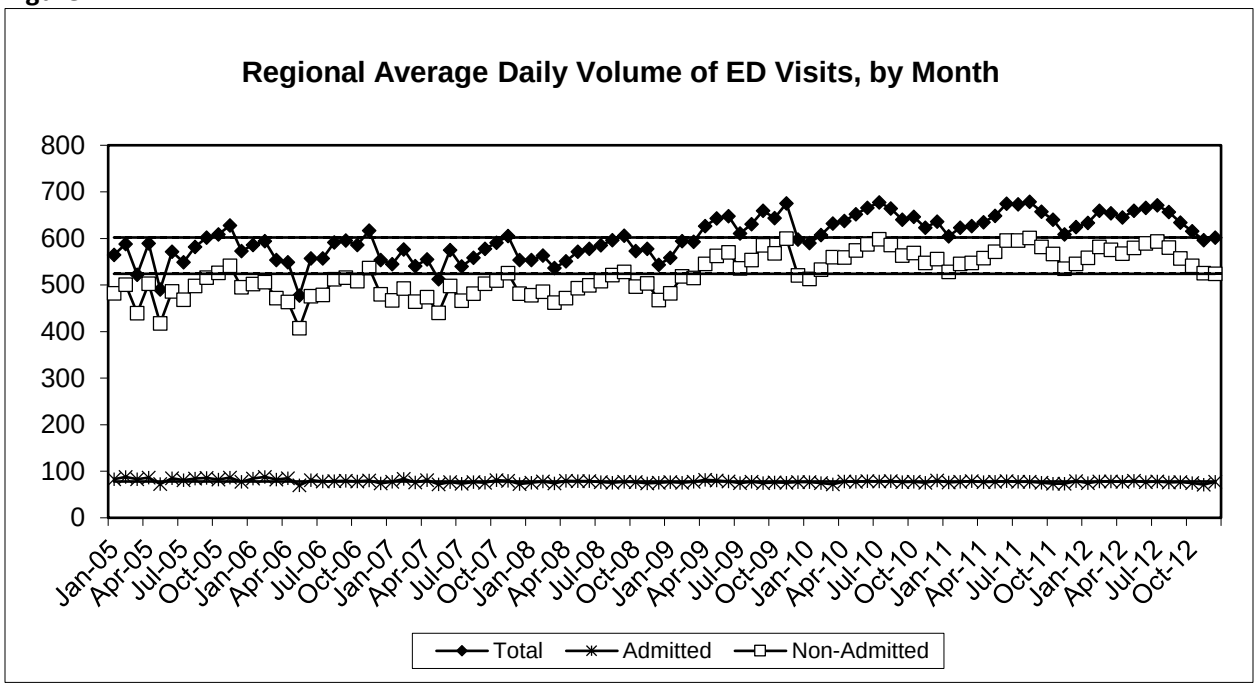
**Appendix A: Quantitative Information Used in the Patient Flow Case Study**

Like many case studies, this one incorporated quantitative data and findings wherever possible to provide context and permit triangulation.[1] The main quantitative component was analysis of flow-related metrics at the regional and site levels. Using administrative data, regional decision-support analysts provided monthly figures for ED and inpatient volumes and average LOS from 1999-2012. Data on patient volumes and admission rates were available for the whole period, but sites had different start dates for the collection of LOS data, ranging from 1999 to 2009. I obtained monthly figures on inpatient separations and LOS at each site, both overall and separately for Medicine and Family Medicine (as total LOS may be heavily influenced by the mix of programs at each site); on the advice of regional analysts, I used inpatient data from the 2004-05 fiscal year onward.

To obtain the clearest possible picture of regional flow trends, monthly data were plotted on run charts, and the presence of significant change was assessed using two rules of statistical process control (six consecutive points ascending or descending, or nine consecutive points above or below the mean).[2] This approach yielded the following observations.

**Figure A-1**




*Note: Average daily volume refers to monthly volume divided by the number of days in the month, to give a more accurate picture of seasonal variation.*

***Emergency Volumes and Admissions***. Emergency volumes showed some increase over the study period, but there was great variability by month, year and site (see Figure A-1). The volume of admitted patients appeared to peak in 2005 and was stable from 2007-12, while the volume of non-admitted patients showed a noticeable rise in early 2009. This rise was largely attributable to a jump in non-admitted patient volumes at two community sites, a finding that may or may not be an artifact of the move to a new Emergency data system in January 2009. Admission rates fluctuated at different sites, in ways that could sometimes be traced to a reorganization of services (e.g., surgical consolidation). From 2009-12, the regional admission rate hovered around 12%.

**Figure A-2**

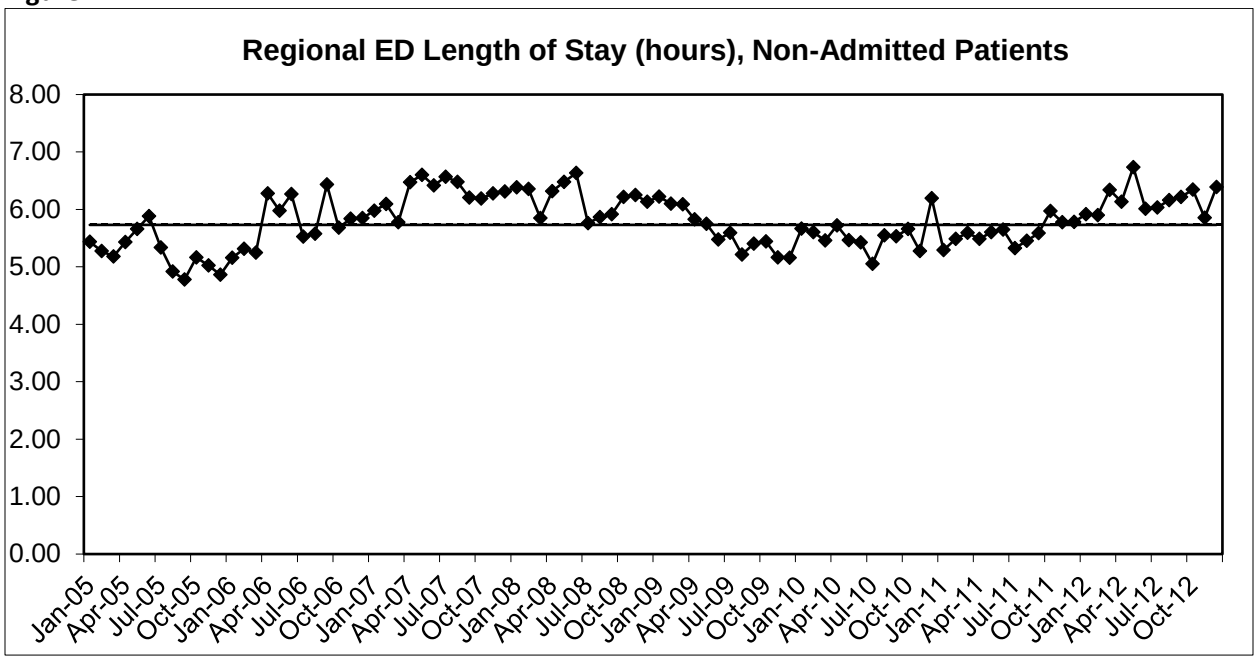
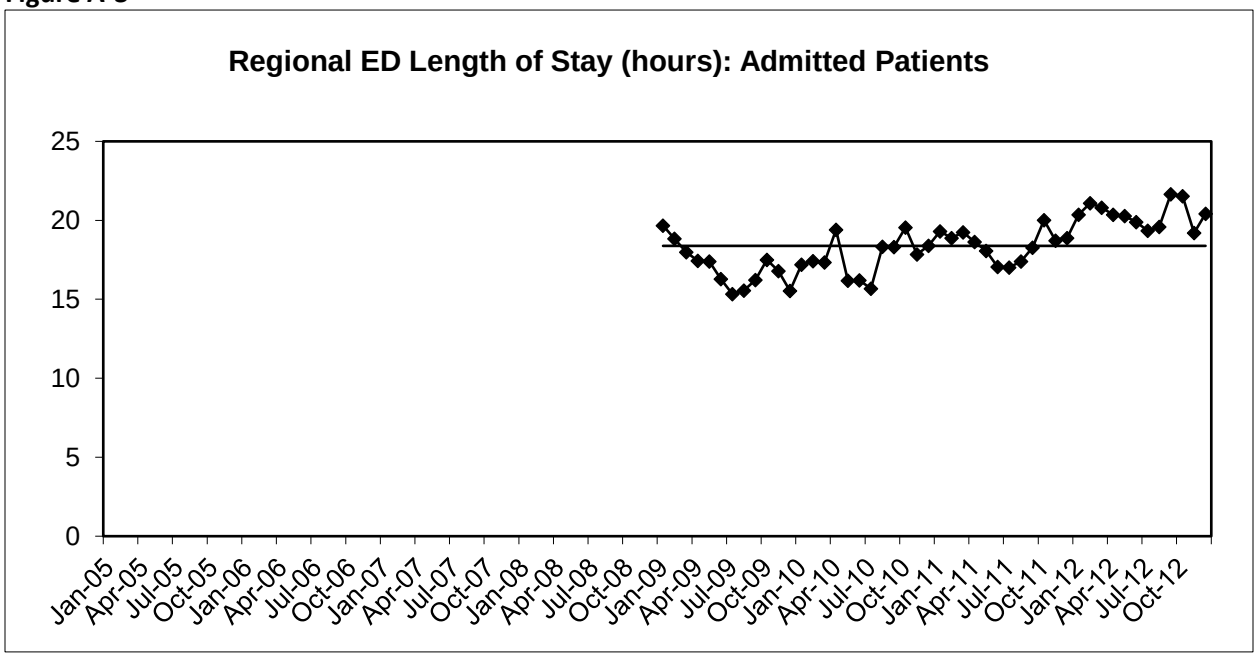


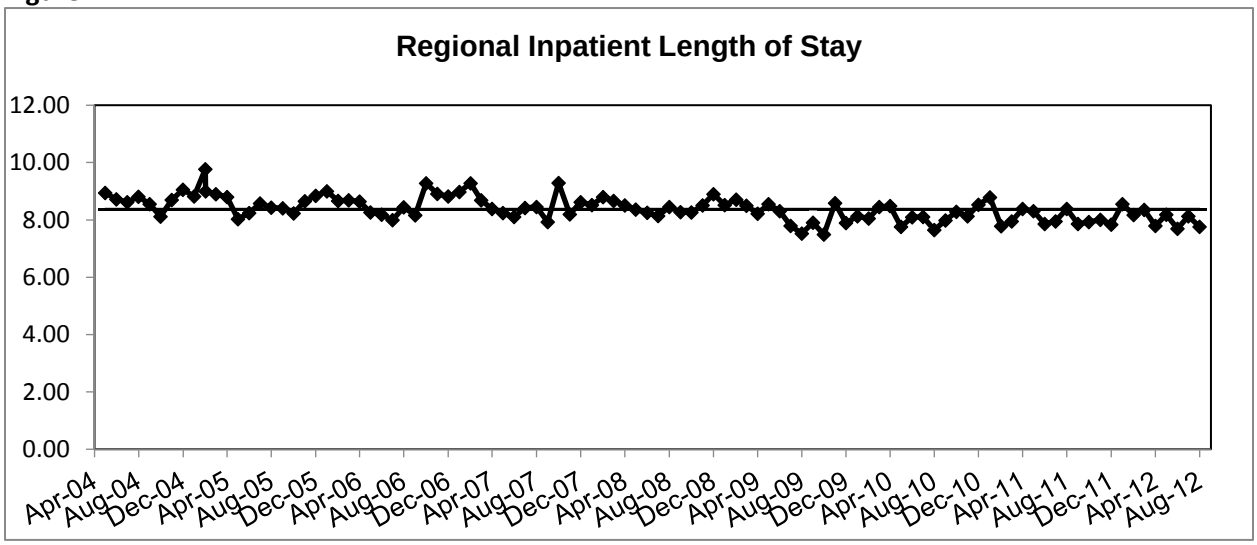

**Figure A-3**




***Emergency LOS.*** LOS of admitted and non-admitted patients fluctuated widely over time at the site and regional levels; the picture is clearly not one of a process in control (see Figures A-2 and A-3). At only one site was there a significant decrease in ED LOS that corresponded to the timing of known flow initiatives; in this case, a multi-pronged strategy appeared to produce an immediate decline in admitted patients' ED LOS, which was sustained for several years (details available from the author). Another site showed a drop in non-admitted patients' LOS that could not be linked to identifiable initiatives; as this

drop occurred around the time of the introduction of the new ED data system, it may or may not reflect a genuine change. Regionwide, ED LOS fluctuated with no overall trend of improvement; if anything, both admitted and non-admitted LOS appeared to be increasing at the end of the study period.

**Figure A-4**




***Inpatient LOS.*** To reduce the impact of a 2008-09 change in coding in which non-acute patients were no longer included in the acute dataset, the regional analyst cleaned the data by removing patients with a non-acute service code. While comparison of cleaned and uncleaned data confirmed that this process made an obvious impact on LOS values, it was not possible to identify all hospital stays with a rehab component; as such, it is likely that pre-2009 figures remained slightly inflated. Overall, the data did not show significant improvement in regional LOS over the course of the study period (see Figure A-4). At various times, LOS appeared to rise or fall at particular sites; some of these changes seemed to correspond with surgical consolidation, while others could not be linked to a specific development. During the last year of the study period, two of the six sites appeared to be experiencing lower LOS than they had in prior years; however, this pattern did not hold when Medicine and Family Medicine patients were examined separately, suggesting that it might have been an artifact of patient redistribution through service consolidation.

***Contribution of Flow Metrics.*** While the metrics suggest a lack of improvement, they cannot prove that improvement efforts were in vain. The period saw some increase in demand, in terms of both volumes and patient acuity, and flow is impacted by factors outside the health system, such as changes in population health and demographics. Nonetheless, as past efforts were expected to do much more than keep up with demand, the indicators do substantiate participants' characterization of the system as struggling to improve flow. The data were also useful for triangulation purposes (e.g., to verify participants' claims about changes or inter-site differences in patient volumes or LOS).

***Other Information on Initiative Outcomes.*** Given the multiplicity of influences on flow and the limited scope of most interventions, global analyses of flow metrics at the regional, hospital, and program levels could not provide a full picture of initiative impacts. Valuable additional information was gleaned from documents, particularly evaluation, project closure, and monitoring reports; about 10% of the ~700 documents collected included quantitative assessment of outcomes. All evaluations had at least moderate risk of bias by virtue of their design, which was most typically an uncontrolled pre-post

comparison; those with severe risks of bias (e.g., major, obvious confounds; probable misreporting) were not considered in the analysis.

**References**


1. Yin RK. *Case study research: design and methods* (4th ed.). Thousand Oaks: Sage Publications; 2009.
2. Hart MK, Hart RF. *Statistical process control for health care*. Pacific Grove, CA: Duxbury; 2002.

**Appendix B: A Decade of Patient Flow Initiatives in the Region**

All initiatives that sought to improve flow into or out of regional hospitals were deemed in scope for the case study, whether the initiative took place in the acute, community and/or long-term care sector(s). Initiatives to increase access to *elective* care were out of scope. The table below reports those initiatives that were initiated or significantly altered during the years 2004-2013.

| Initiative | Year Introduced |
|---|---|
| ***Input*** | |
| Telephone advice line | 2003-04; improvement efforts at various times thereafter |
| Primary health care centres, intended for high-needs populations | First in 2004; several more built 2007-13 |
| Direct admissions/direct access for certain types of patients | Varied by site; 2005-2012 (all sites) |
| Media campaigns to discourage ED use | 2005 and 2013 |
| Primary care renewal efforts that engage fee-for-service physicians | Regional and provincial efforts intensifying since 2006 |
| NPs at nursing homes to reduce ED visits | Piloted 2007; implemented elsewhere (3 nursing homes) 2008 |
| Community intravenous program (relocate ED visits to community sites) | 2008 |
| Supportive housing initiatives for vulnerable populations | Several initiatives, various start dates 2008-2011 |
| Case management for frequent ED attenders | 2009 at inner-city site |
| Program of integrated management for the elderly | 2009 |
| Bridge care clinic for refugees | 2010 |
| Community paramedics at shelter/detoxification centre | 2011; NP added 2012 |
| Hospital home team | Small pilot 2011, ongoing expansion |
| Supports for seniors in subsidized housing | 2011 (multiple buildings; provincial initiative) |
| Non-ED options for urgent care | Two clinics providing primary-care type urgent care opened in 2012; other urgent care options longstanding. Mental health crisis response centre 2013. |
| ***Throughput*** | |
| ED Renovations | Varied by site (all sites); 1999-2010 |
| Extended hours or increased staff: allied health | Varied by site (all sites), 1999-2010. |
| Extended hours: diagnostic testing | Varied by site (all sites), 2004-2009. |
| Geriatric assessment team in ED | Pre-2004; improvements 2004 |
| Minor treatment area | Varied by site (2000-08), maintained at 4 sites. Some staffed by NPs. |
| Non-physician providers (NPs, PAs) | Varied by site (5 sites), 2004-2012 |
| Care maps | Varied by condition; most in place by 2005, some added 2011 |

| Initiative | Year Introduced |
|---|---|
| Reassessment nurse | 2005 |
| Nurse-initiated ordering protocols | Varied by site (all sites, 2003-2012); introduced regionally in 2006; adherence variable. |
| Diagnostic testing redesign | Varied by site (3 sites); 2007-10 |
| Process improvement projects (e.g., Lean), ED | Numerous; dates varied (all sites), 2007-11 |
| Redesign of ED space (e.g., internal waiting room) | Varied by site (3 sites), 2007-09. |
| Rapid assessment zone | 2011 at one site; planned at another. |
| ***Output*** | |
| Short-stay unit | All but one site had longstanding observation units; one doubled its clinical decision unit 2008. Short-stay unit for "can't-go-home" patients at one site, 2012 (stopped 2013). |
| Admission and/or discharge process redesign | Numerous initiatives, regional and site-specific; dates varied 2002-2012 (all sites). |
| Day surgery | Greatest shift from inpatient surgery in 2004 |
| Geographic physician model | 2006 in Medicine program |
| Process improvement projects (e.g., Lean), inpatient | Numerous; dates varied (all sites), 2008-12 |
| Subacute units | 2000 (stopped 2006) at one site; 2005 (stopped 2009) at another. |
| Electronic utilization management tool | 2005; subsequent initiatives sought to improve use (2007-09) |
| Discharge coordinators | Discharge facilitators longstanding at some sites; utilization facilitators introduced 2006; one site piloted complex case navigator 2008. Mental health transition specialist 2005. |
| Bed meetings/huddles | Site specific in at least two sites (2007 and 2012, not necessarily maintained); daily regional bed call since 1998. |
| Extra home care resources in hospital | Pilots at two sites (2008 and 2012); funding not sustained. |
| Discharge rounds | Varied by site (all sites); most began 2007-2009 and continued; some added new types of rounds (e.g., complex patients) 2011-2012. |
| Increased long-term care spaces | Increased supportive housing units 2008, 2009. (Nursing home beds increased markedly 1999-2001 but not thereafter.) |
| Whiteboards (for discharge planning) | Varied by site (5 sites); 2009-2012. |
| Flightboards (for discharge planning) | 2009 at one site; dates unclear at 4 other sites |
| Home care staffing changes | Rollout of EFT (non-casual) staffing began 2011 |
| Care pathway (multi-sector) | 2012 pilot (COPD) by one site, expanding |

**Appendix C: Interview Guide**

1. Could you start by telling me about your role and your involvement in improving flow?
    - Probe: How long have you been in this role? (Ask about past roles in the organization if applicable.)

2. Please describe [XYZ project, as applicable] and your role in it.
    - How did you choose this particular initiative? (What problem were you trying to solve? Where did you get the idea? Who was involved in the decision?)
    - Can you walk me through the process of implementing the project?
    - What worked well? What didn't work well?
    - Did you encounter major barriers to implementing the project? If so, what were they? What caused them? How did you address them?
    - What were the project's outcomes? Why do you think this occurred?
    - Have you tried to spread the project beyond [area]? How has that gone?

3. Now looking at the regional level: overall, how do you feel efforts to improve patient flow are going?
    - Probes: What has worked well? What hasn't? Why? (Ask for examples.)
    - What do you think are the most important things the Region should do to improve flow? (What would that look like? What would it take?)
    - How important do you think it is for all the hospitals to have similar processes or similar initiatives for improving flow?
    - What do you think should be the role of (programs, sites) in improving flow? Why?

4. Is there anything else we should know?

5. Is there anyone else we should talk to?