Clinicians and CSIRO: a perfect partnership

Dr Andrew Staib MBBS FACEM Deputy Director of Emergency Medicine
Dr Clair Sullivan MBBS (Hons) MD FRACP Endocrinologist and Deputy Chair of Medicine

Princess Alexandra Hospital

@clairsullivan23 @andrewstaib
Acknowledgments

• CSIRO
• Health Roundtable (Dr Rohan Cattell and Dr Ian Tebbutt)
• Dr Ian Scott, Dr Anthony Bell, Dr Rob Eley, Dr James Lind
• Metro South ICT and Dr Bronwyn Griffin
• CARU and Dr Michael Cleary
This is about patients
Our day jobs

- We work at one of Australia’s leading hospitals
- Over 500 beds, over 60 000 ED presentations/year
- 90 000 admissions to ward/year
- Over 500 000 outpatient appointments/year
- Nearly 1000 doctors
- Massive basic science and clinical research facility
- Like most Australian hospitals, no health systems research
- We are not managers/administrators but systems physicians
Our day jobs

• Andrew
  - emergency physician
  - Manage ED that treats 60000 of the sickest and most complicated patients in Queensland every year
  - $50 million Budget, 85 doctors, 170 nurses, 30 allied health staff
  - Limited research background

• Clair
  - endocrinologist
  - research doctorate but basic science
  - operational responsibility 200 doctors and 200 Million/year

Both still seeing patients...really sick patients
What was the problem?

• Access block and ED overcrowding
  • You wait for ages when you are at your most vulnerable and distressed
  • Expert clinicians run around making space and answering phone calls instead of looking after you
  • You or your family lie in an ED for up to 2-3 days waiting for a bed
  • People die (more than the road toll)
  • Ambulances are not available to come to you
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Brisbane's Princess Alexandra hospital has worst national figures for emergency department admission and discharge

Janelle Mills
The Courier-Mail
December 14, 2012 1:35AM

The emergency department of Brisbane's Princess Alexandra Hospital has recorded the worst patient admission and discharge rates in the country. PIC: David Kelly

THE Princess Alexandra Hospital has recorded the nation's worst emergency department figures, in terms of the percentage of patients discharged or admitted to a ward within four hours.

A National Health Performance Authority report shows just 33 per cent of patients left the PA's ED within four hours last financial year, compared with the 54 per cent average among all major metropolitan hospitals.

The report, to be released today, also reveals 10 per cent of ED patients requiring admission to a ward at the Princess Alexandra waited more than 28 hours in 2011/12.

It shows the hospital on Brisbane's southside must improve a lot to make the national target of 90 per cent of patients leaving the ED within four hours.

But it is not alone.

The only Queensland public hospital to reach the 90 per cent target last financial year was Prince...
NEAT 2011

• 4 hour rule a challenge
  • “worst” in Australia
  • admitted EDLOS >9 hours
  • EDLOS for discharged patients was 6 hours
  • Almost half patients admitted,
  • giving a NEAT of <40%

• Where to start?
Only so much you can do without help

• Discharges and Short stay processes only get you so far
• This was designed to be a whole of hospital process, but only the ED was in focus
• Needed to convince some friends to help.....
• But they weren't interested in “my” time target
Operational Data Analysis c2012
Operational Data Analysis c2012

• Hospital occupancy measurement didn’t help
• Manual data collection of what seemed to matter to ED on an iPad
• Began to notice some trends because graphs started to look the same

• Remember- I was making operational decisions for 60000 sick patients and a $50mill enterprise on this level of analytics
Then after about a year....

• I showed some of my overlapping graphs to someone else
• Who initially laughed at me, and then ...
• We were asked to treat patients to a time target....not very interesting
• No evidence that we could find for the 4 hour target...so....
STAND BACK

I SMELL SCIENCE
Measuring the quality of healthcare

• How to measure the quality of care?

**Process measures** (how quickly you build the car)
-time eg NEAT, NEST, time to antibiotics

**Outcome measures** (how well the car runs)
-patient focussed eg deaths, adverse events
How about clinicians?

• Clinicians not interested in process measures (time)
• Clinicians care about outcome measures (patient outcomes)

Can we combine time and process measures?
Patient outcomes....

• Death
• Deterioration (rapid response calls, cardiac arrest)
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**Notes:**
- Blood pressure taken.
- Respiratory rate checked.
- Temperature recorded.
- Pulse rate monitored.
Implications

• We now have a way to measure outcome consequences of ED-inpatient interface, and ED access process changes
PAH NEAT Safety Dashboard

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<td>Inpatient mortality for patients admitted from PAH ED (%)</td>
<td>2</td>
<td>2.4</td>
</tr>
<tr>
<td>PAH Standardised Hospital Mortality Ratio</td>
<td>80</td>
<td>85</td>
</tr>
<tr>
<td>RRT calls to PAH inpatients admitted &lt; 24 hrs from PAH (rate per 1000 admissions)</td>
<td>4.9</td>
<td>8.1</td>
</tr>
<tr>
<td>Cardiac Arrest calls to PAH inpatients admitted &lt; 24 hrs from PAH (rate per 1000 admissions)</td>
<td>1.4</td>
<td>0.9</td>
</tr>
</tbody>
</table>

ED Attendances and NEAT


The image shows a scatter plot with a line of best fit. The equation for the line is $y = 0.0361x - 9.4076$ with an $R^2$ value of 0.304 and a $p$-value of 0.1.
Midnight Hospital Occupancy and NEAT

Practical Access Number for Emergency and NEAT

Inpatient Cubicles in Emergency


\[ y = -2.9416x + 43.339 \]

\[ R = 0.734 \]

\[ p = 0.0001 \]
Emergency HSMR and Inpatient NEAT: An Even More Powerful Association

Slope = -1.802 ± 0.207
Y-intercept = 116 ± 4.689
X-intercept = 64
R² = 0.873
P<0.0001

Reduction in Deaths associated with improved NEAT. Who benefits most and why?

• We halved deaths across the ED-inpatient interface
• No clinical decision unit or big spend
• Smart low cost clinical redesign
• Who benefitted?
• Who didn’t?
Which patients are more sensitive to the quality of the ED-inpatient interface?
Which diseases are more sensitive to the quality of the ED-inpatient interface?

Sullivan CM, Staib, A et al. (2015) Who is less likely to die in association with improved NEAT compliance? Australian Health Review AH14162 Accepted or review 2015
Brisbane hospital makes big recovery
Clifford Land, AAP National Medical Writer
AAP
July 25, 2013 4:49PM

A Queensland hospital has bounced back from the shame of having the slowest emergency department in Australia.

Princess Alexandra Hospital’s emergency department was singled out in 2012 for its tardiness, meeting time targets for only 33 per cent of patients.

On Thursday it was named as the most improved based on 2013 figures, with 62 per cent of patients making it out of the department within the targeted four hours.

“We have gone from being far and away the worst to at least being in the middle of the pack,” said Dr Andrew Staib, the deputy director of emergency department.

It was a multi-faceted effort, he said. “But there is still a lot of work to do.”

Queensland was the best performed state in Australia for the March 2013 quarter, with 11 of its 24 major hospitals meeting its 77 per cent target, according to National Health Performance Authority figures published on the MyHospitals website.

YOU’LL BE APPIER WITH OUR APP.
What is a Systems Physician?

• A systems physician diagnoses and treats problems with individual patients and with the system

Ideal partners for scientists and ICT innovation..
The idea of systems physicians starts to spread...

• This was some cool work we did at our own hospital. But really the first time systems physicians have started publishing and treating the “system” as well as individual patients

• Started to get asked to help with problems outside our own hospital

• Asked to provide expert advice to Queensland Clinical Senate and Department of Health

• CLEAR formation 0.6M$ grant from DOH
CLEAR

• Collaboration for Emergency Admission Research
• Systems physicians, CSIRO, health roundtable
• High level research capability coupled with large operational responsibility to direct translate this research into patient care
• Reports to Queensland DOH and Queensland Clinical Senate
The Future of NEAT

We have published evidence that improved NEAT compliance reduces deaths (NEAT approx 70%)

No evidence anywhere in the world that this benefit to patients will proportionally increase with NEAT 90% despite 120 million dollar spend nationally

Important to have robust process measures as well as outcome measures

HRT replicated analysis

National analysis by CSIRO
(Justin Boyle, Sankalp Kanna, Norm Good)

Health Roundtable Extract
1 July 2010 - 30 June 2014

168 Aus & NZ sites

33 NZ Excluded

26 sites no ED data

48 sites missing other ED data

2 sites specialist unpeered

135 Aus

109 sites

61 sites

59 sites

NSW | NZ | QLD | SA | TAS | VIC | WA | NT | ACT | TOT
---|----|-----|----|-----|-----|----|----|-----|------
36 | 0  | 34  | 10 | 1   | 37  | 10 | 5  | 2   | 135  
32 | 0  | 26  | 8  | 1   | 29  | 6  | 5  | 2   | 109  
8  | 0  | 17  | 5  | 1   | 23  | 5  | 1  | 1   | 61   
8  | 0  | 17  | 5  | 1   | 21  | 5  | 1  | 1   | 59   

Queensland Government | Princess Alexandra Hospital - Brisbane, Australia
Historical NEAT Daily (NEAT)

- Financial incentive targets = 1 Jan
Summary

• 12 million ED attendances
• 4 million admissions
• 46000 inpatient deaths
• Across Australia for 4 years

• CSIRO completely rebuilt eHSMR model from the ground up and did the stats properly

• And the answer is.....
P-VALUE < 0.05?

DATA ANALYSIS COMPLETE!
The answer

• Is a standing agenda item at the Health Principles Committee
• Is going to the Australian Health Minister’s Advisory Council in Canberra in June
• Is likely to change the way emergency care is delivered to millions of Australians
Challenges for scientists working with clinicians

• Beware the mad clinician and the EOI volunteers and Workshops
• Limited understanding of your work (but a good clinician will try)
• May have pre-existing biases
• Different timescale ie used to staying awake all night working
• Have to make life changing decisions with incomplete and uncertain information.
• Validation methods likely to be different to yours
Benefits for scientists of working with clinicians

• People tend to listen to them
• Good communicators
• Good at getting resources
• The right clinicians can help formulate the questions that are relevant
• Should help form the data into a story that will change practice
• The right clinicians will be able to directly translate your findings into better outcomes for patients
What next?

• Systems physicians, CSIRO and the digital hospital
• One quarter of a billion dollar project
• Largest health ICT project ever in Australian hospital
Thank you to CSIRO and HRT

• The power of the analysis undertaken was unimaginable to us a year ago
• Long way from set square and excel spreadsheet to supercomputers and some of the smartest people we have ever met
• Our scale of practice from individual patients, to 60 000 patients a year to 5 million patients a year
• This collaboration will improve the way emergency hospital care is delivered to millions of Australians