



**Healthy London
Partnership**

directors of
adass
adult social services

Taster session: Data for diagnosis and measuring improvement

Dr Tom Woodcock

Supported by and delivering for:



Public Health
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London's NHS organisations include all of London's CCGs, NHS England and Health Education England

Outline of the taster session

Aims and objectives of the session:

- To be aware of the key role variation plays in understanding and improving a system, and of simple statistical tools to understand variation.

We will look at examples of different ways of analysing and presenting data, and how they help or hinder efforts to understand and improve unscheduled care. We will consider how data from different parts of the system can be useful for improvement.

By the end of the session we will have:

- An understanding of how to diagnose the system through simple statistical analyses
- Identified next steps to progress measurement systems locally

Outline of session

- | | | |
|---|--|--|
| 1 | Introduction | |
| 2 | Diagnosing the system 1: Understanding variation | |
| 3 | Diagnosing the system 2: Understanding flow | |
| 4 | Group exercise | |
| 5 | Conclusions | |
- | | | |
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-



"After careful consideration of all 437 charts, graphs, and metrics, I've decided to throw up my hands, hit the liquor store, and get snookered. Who's with me?!"

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"So things are good, stuff is OK, and I reiterate my request for more specific data."



"Phew! I narrowly avoided a near miss."

AE Dashboard

A&E Activity undertaken																
Daily A&E Waiting Figures																
	Total (Type 1)				UCC				% of Type 1 Attendances to Total Attendances	Total (Type 1 + 3)				Ambulance Arrivals	No. Admissions	No. Discharges
	<4 Hrs	4+	Total	Target %	<4 Hrs	4+	Total	Target %		<4 Hrs	4+	Total	Target %			
12/01/2015	168	8	176	95.45%	105	0	105	100.00%	62.6%	273	8	281	97.15%	81	78	74
13/01/2015	159	20	179	88.83%	96	0	96	100.00%	65.1%	255	20	275	92.73%	87	75	91
14/01/2015	173	9	182	95.05%	94	0	94	100.00%	65.9%	267	9	276	96.74%	80	77	73
15/01/2015	170	6	176	96.59%	75	0	75	100.00%	70.1%	245	6	251	97.61%	83	75	80
16/01/2015	181	14	195	92.82%	109	0	109	100.00%	64.1%	290	14	304	95.39%	87	73	77
17/01/2015	167	5	172	97.09%	103	0	103	100.00%	62.5%	270	5	275	98.18%	76	57	41
18/01/2015	137	9	146	93.84%	115	0	115	100.00%	55.9%	252	9	261	96.55%	78	44	26
	1,155	71	1,226	94.21%	697	0	697	100.00%	63.8%	1,852	71	1,923	96.31%	572	479	462
19/01/2015	151	38	189	79.89%	102	0	102	100.00%	64.9%	253	38	291	86.94%	85	79	71
20/01/2015	153	21	174	87.93%	104	0	104	100.00%	62.6%	257	21	278	92.45%	76	60	75
21/01/2015	173	10	183	94.54%	111	0	111	100.00%	62.2%	284	10	294	96.60%	83	67	61
22/01/2015	160	13	173	92.49%	115	0	115	100.00%	60.1%	275	13	288	95.49%	89	59	78
23/01/2015	156	8	164	95.12%	107	0	107	100.00%	60.5%	263	8	271	97.05%	77	73	81
24/01/2015	174	4	178	97.75%	105	0	105	100.00%	62.9%	279	4	283	98.59%	84	39	49
25/01/2015	165	4	169	97.63%	123	0	123	100.00%	57.9%	288	4	292	98.63%	82	39	25
	1,132	98	1,230	92.03%	767	0	767	100.00%	61.6%	1,899	98	1,997	95.09%	576	416	440
26/01/2015	163	51	214	76.17%	107	0	107	100.00%	66.7%	270	51	321	84.11%	89	91	61
27/01/2015	180	6	186	96.77%	133	0	133	100.00%	58.3%	313	6	319	98.12%	83	59	82
28/01/2015	185	11	196	94.39%	92	0	92	100.00%	68.1%	277	11	288	96.18%	91	62	71
29/01/2015	168	7	175	96.00%	108	0	108	100.00%	61.8%	276	7	283	97.53%	79	64	98
30/01/2015	179	6	185	96.76%	105	0	105	100.00%	63.8%	284	6	290	97.93%	77	72	80
31/01/2015	146	12	158	92.41%	118	0	118	100.00%	57.2%	264	12	276	95.65%	80	40	26
01/02/2015	152	6	158	96.20%	97	0	97	100.00%	62.0%	249	6	255	97.65%	76	54	29
	1,173	99	1,272	92.22%	760	0	760	100.00%	62.6%	1,933	99	2,032	95.13%	575	442	447
02/02/2015	183	32	215	85.12%	132	0	132	100.00%	62.0%	315	32	347	90.78%	95	78	59
03/02/2015	190	13	203	93.60%	119	0	119	100.00%	63.0%	309	13	322	95.96%	90	72	75
	373	45	418	89.23%	251	0	251	100.00%	62.5%	624	45	669	93.27%	185	150	134

Importance of Qualitative Data

[Home](#)[Who we are](#)[What we do](#)[Contact](#)

Patient Voices: The Patient Voices digital stories

[Homepage](#) / [Patient Voices: The Patient Voices digital stories](#)

The Patient Voices digital stories

The Patient Voices digital stories use video, audio, still images and music to convey patients', carers', practitioners' and managers' own stories in a unique way. They are intended to touch the hearts of managers, clinicians and others striving to improve the quality of health and social care, and our workshops being are increasingly used to engage with, and evidence outputs from, the Patient and Public Involvement (PPI) and patient engagement agendas, together with being used to provide qualitative evidence of the patient experience.

Distribution of these stories is funded solely by Pilgrim Projects Limited as a social enterprise. Please let us know how and when you use the stories, so that we can use your experiences to persuade sponsors to support the development of more stories for everyone to use.

The stories

Most stories are gathered during small-group workshop sessions with storytellers, who may be patients, carers, managers and/or healthcare professionals. These workshops typically last between two and four days, with pacing and level of technical content adjusted to suit each group of storytellers. The Patient Voices workshops are run using a methodology developed and enhanced by Pip Hardy and Tony Sumner over several years for use in health and social care and educational settings. The aim of a workshop is to facilitate storytellers in a journey through a process which will result in them producing a Patient Voices digital story which is 'Effective, Affective and Reflective' (Sumner, 2008).

- [Complex pain, complex teams](#)
- [Terrific Teens](#)
- [Compassion in ExL C](#)
- [DNA of Care](#)
- [Dementia Insights](#)
- [Champions](#)
- [Living with Dementia](#)
- [Power of Story](#)
- [Positively Different](#)

Quotes – focus group discussions

"It's just the fact that it's because we are in this excruciating pain that we go into A&E, it's not as if it's a luxury. When most of us leave our homes then it's got to that stage that we can no longer cope at home by ourselves... when we do go they seem to think, oh, you know, they're causing a lot of noise and screaming, they're a nuisance ..."

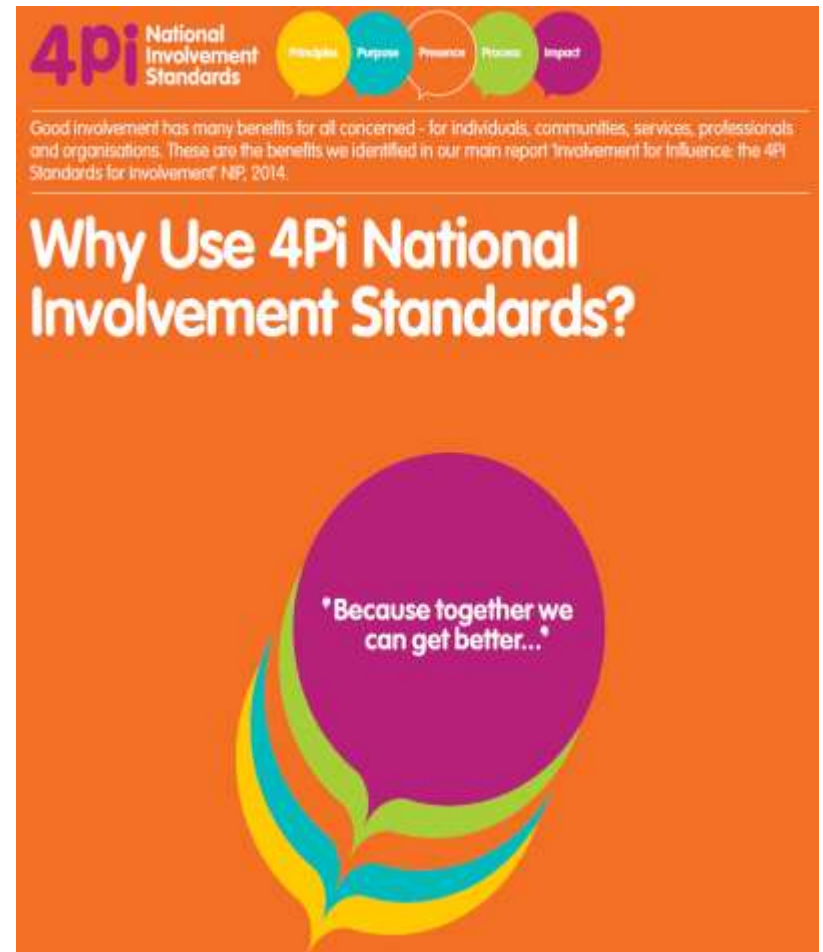
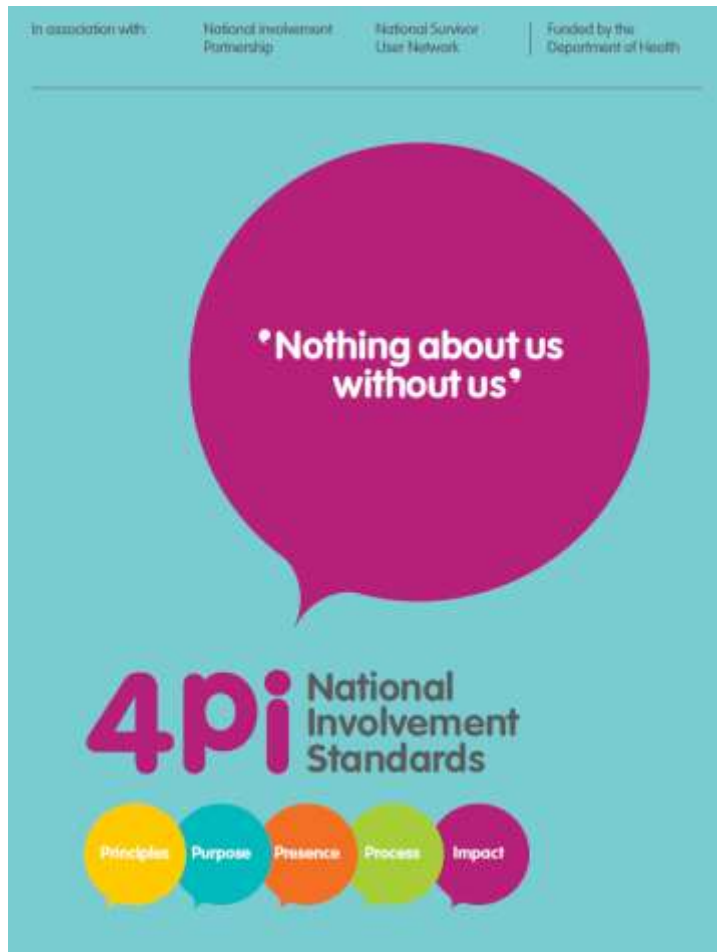
"I feel like a car... because when you get a new car it feels like you can't really do much with it because you're scared you might break it. And with my life sometimes I feel like I can't do much otherwise I might damage myself."

"The thing is, most of us know what we have... if you go into hospital, you probably know more about yourself than the doctor will know about you... but it would be better for the community to learn about the condition."

"A couple of years ago when I was studying, I couldn't hand in my work in time because I had a crisis, and I got penalised for that. I tried to explain, and they didn't understand."

"It [transition] was a shock, ...you get to that stage and you think that okay fair enough, I think I'm growing up now, and then they put you in a ward with mostly geriatric patients, you find that you're the only young person on that ward."

Beyond stories and data

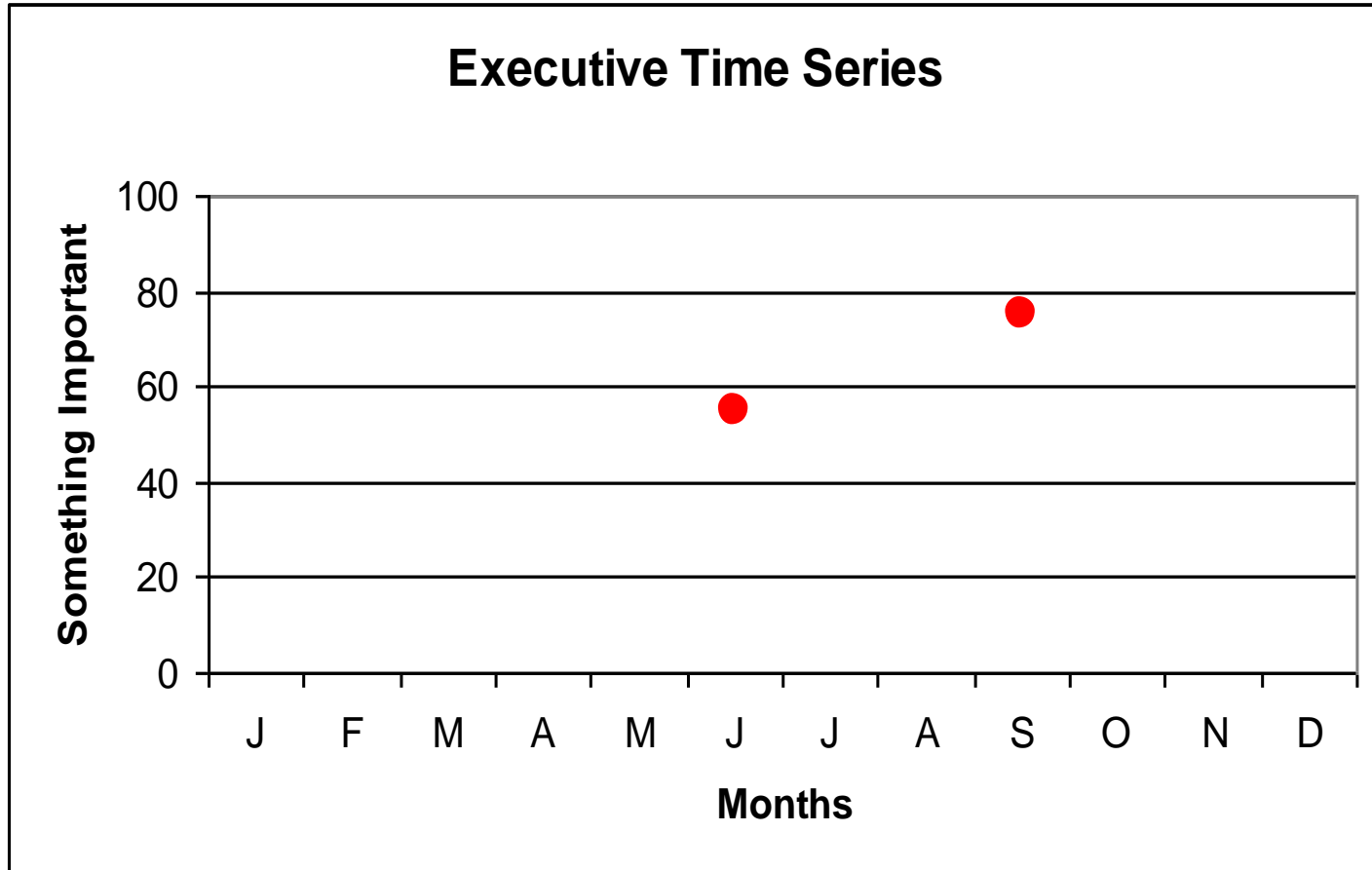


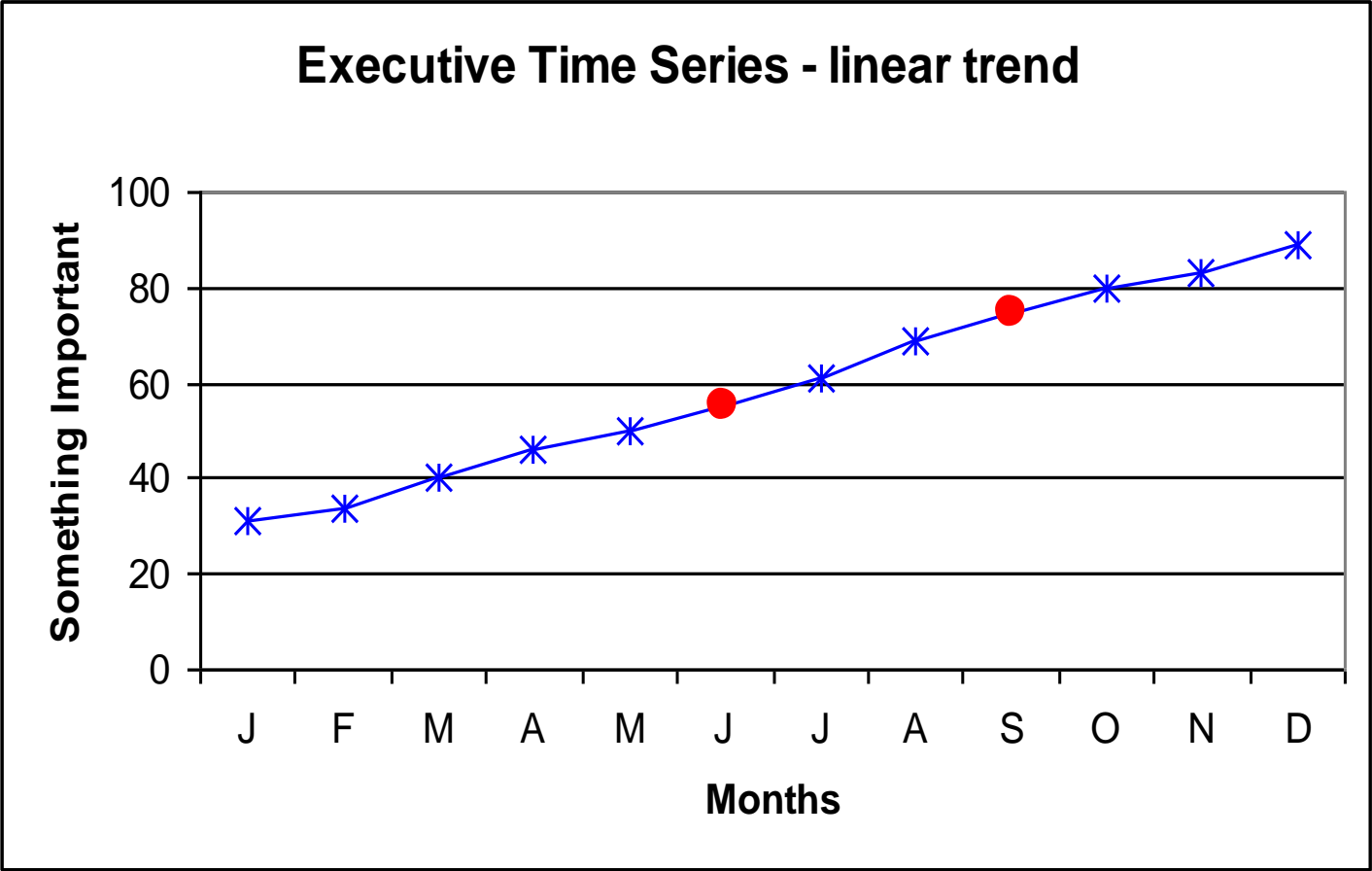
<http://www.nsun.org.uk/about-us/our-work/national-involvement-partnership/national-involvement-standards-launched>

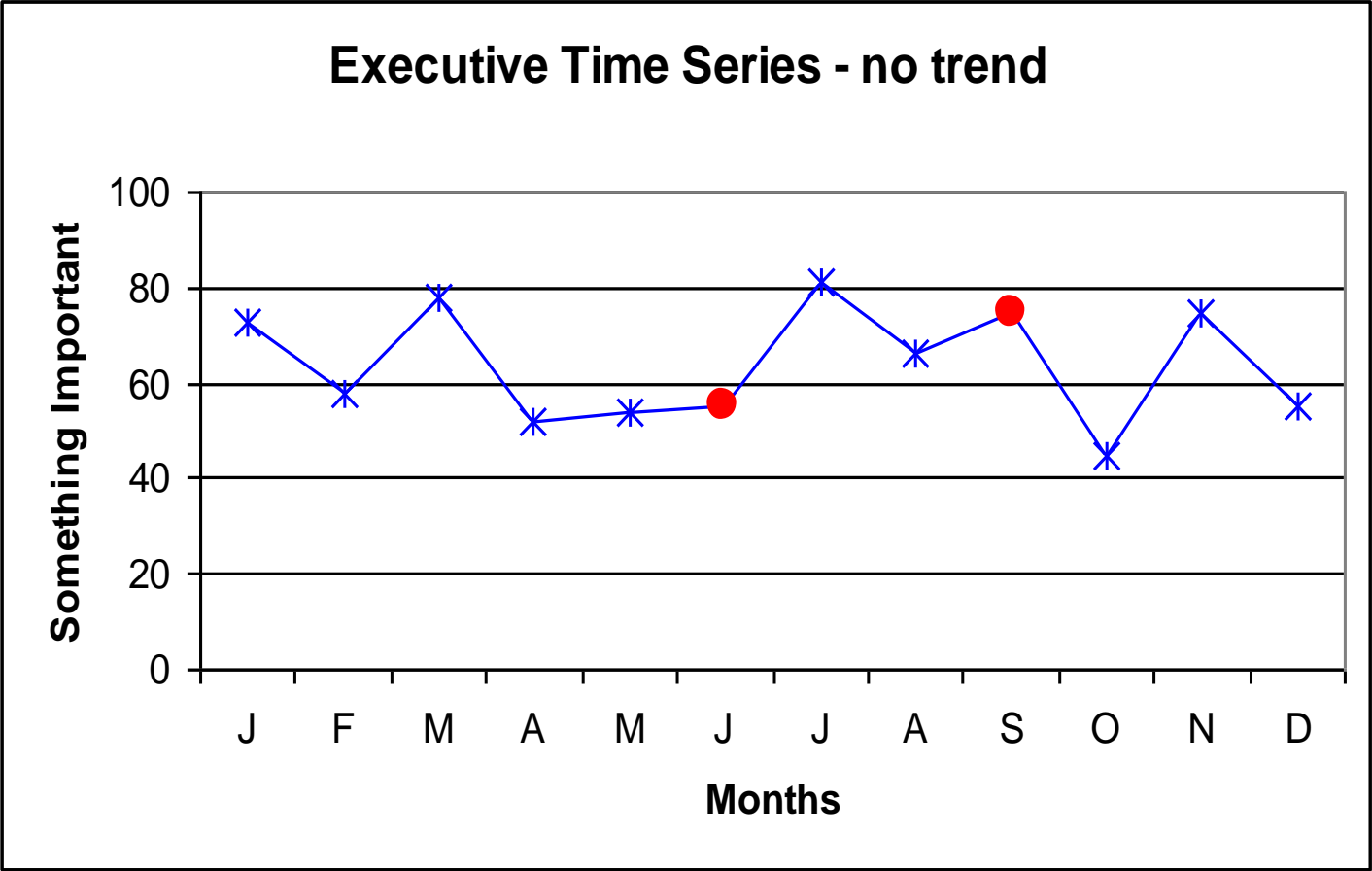
DIAGNOSING THE SYSTEM 1: UNDERSTANDING VARIATION

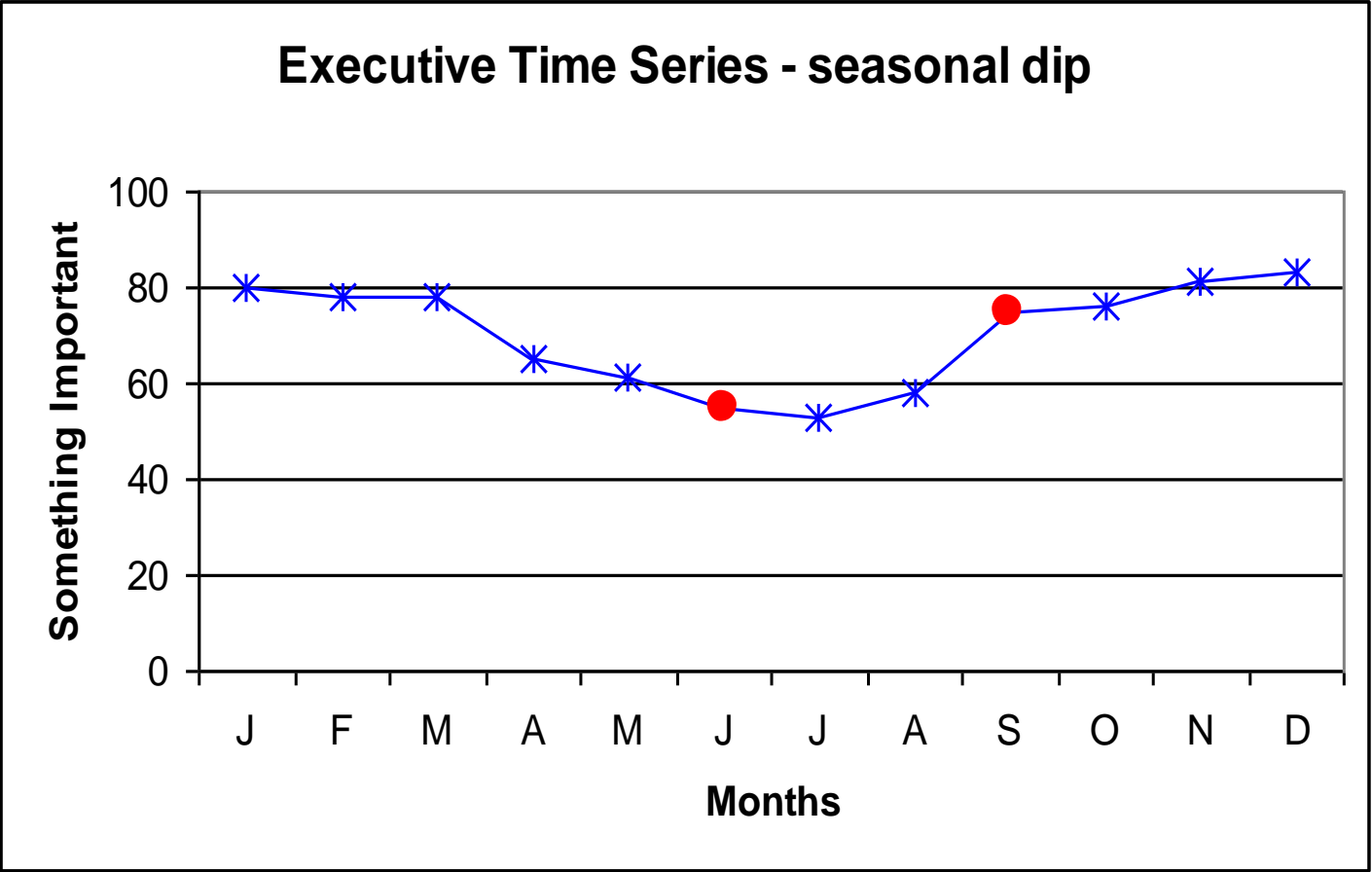
We have 2 quarterly data points - is this an improvement?

Credit: M Davidge









Understanding variation

- Everything we can measure will vary
- Statistical Process Control separates out Special Cause from Common cause (routine variation)
 - **Common:** inherent to the process, none dominant
 - **Special:** due to a specific reason, dominant
- SPC provides rules for detecting special cause variation
- This is crucial in making good decisions about improvement...

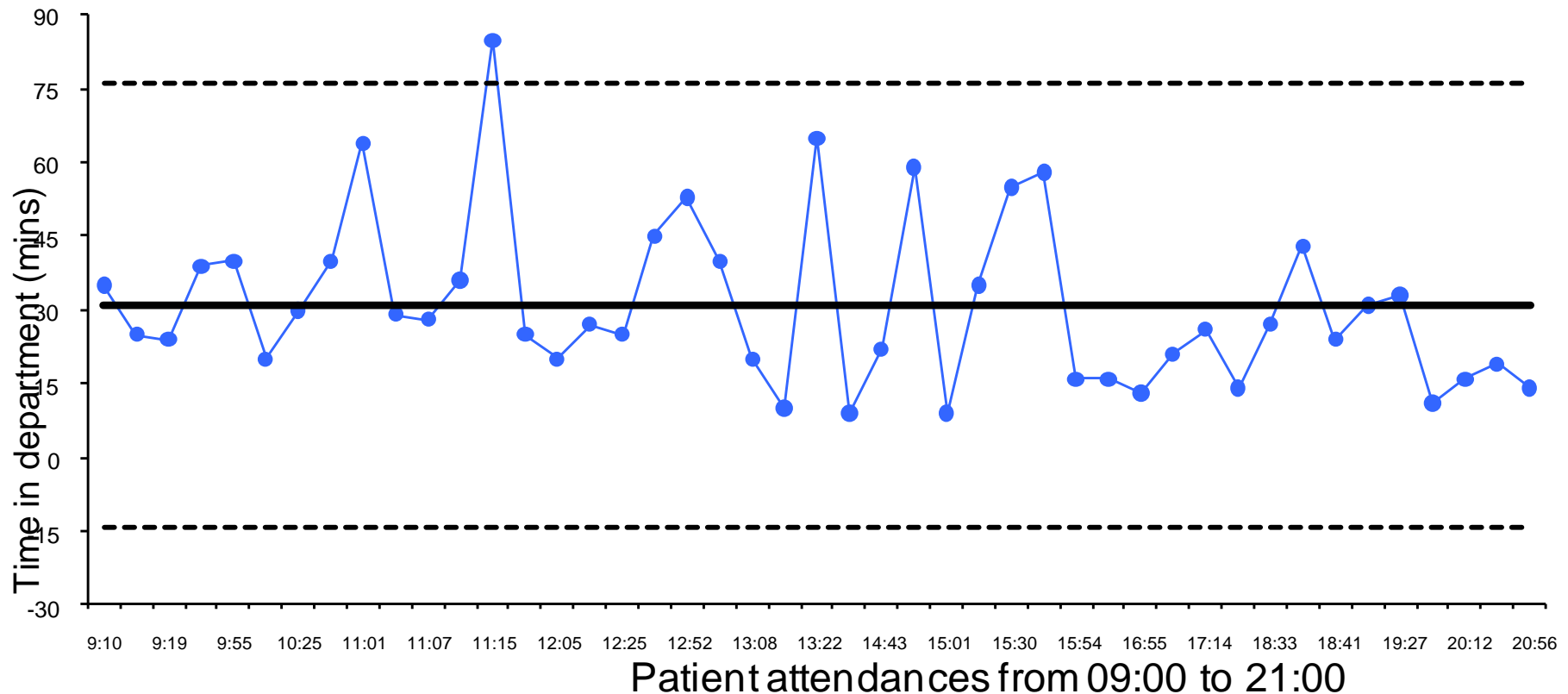
Control Charts

Characterise Variation

SOMEWHERE HOSPITAL

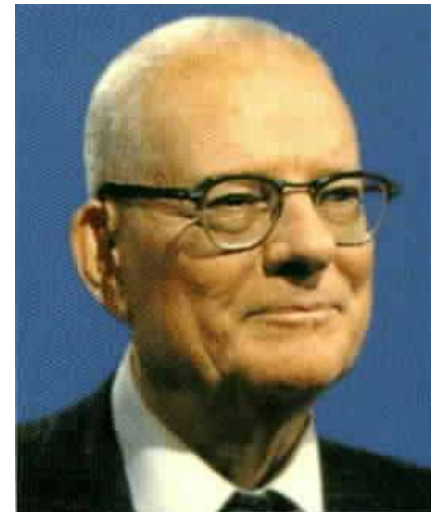
X Chart of Time in Department of patients attending A&E

Flow 1 attendances | 26 January 2007 | 09:00 to 21:00



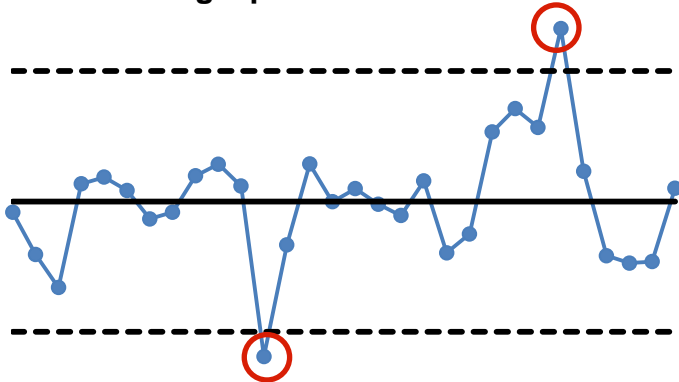
SPC: Origins

- Dr. Walter Shewhart: physicist & engineer, Western Electric and Bell Laboratories, 1920s. Quality in manufacturing.
- Dr. W. Edwards Deming extended Shewhart's work, developing and explaining applications (U.S. Then Japan after WWII, worldwide in the 80s and 90s).
- Increasingly seen in healthcare – but applied with varying degrees of rigor and success.

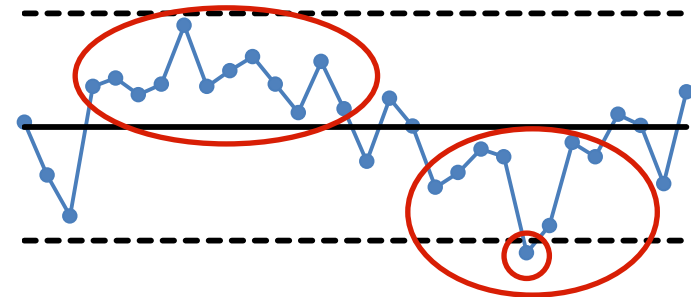


Rules for Detecting Special Causes

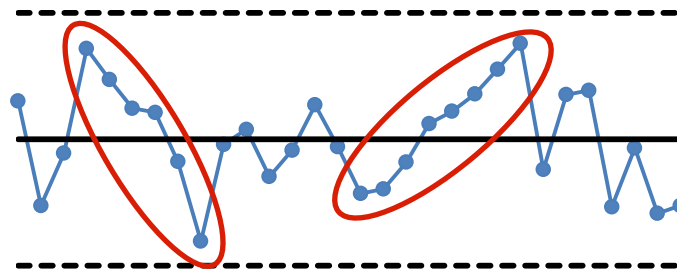
1. A single point outside the control limits



2. A run of Eight or more points in a row all above or all below the centre line



3. Trend - Six or more consecutive points all increasing or decreasing



(For more information, and complete set of rules: HC Data Guide p116)

Diagnosing your process 1

- A process can be in or out of statistical control
- “In statistical control” = no rule breaks
 - many causes of variation – chance, none dominant over the others
 - most data fall within process limits
 - this is routine variation or “common cause” variation
 - process will continue to deliver same results (predictable variation)
- In statistical control:
 - only way to improve is to change the process

Diagnosing your process 2

- “Out of statistical control” = rule breaks
 - Still contains routine variation
 - also **exceptional variation** – e.g. **outside limits**
 - causes that **dominate** (assignable/special)
 - BUT process is in flux (for better or for worse)
 - variation is not predictable
- Out of statistical control
 - Improve by **removing assignable causes** of variation (or changing the process).

Common Causes of Variation

- Are inherent to the process
- Could affect the outcome at any time
- Are numerous in any given process
- None have a particularly dominating effect over the others

Example: for ambulance response times
– usual traffic

Process is stable over time: said to be *in statistical control*.

Possible to predict its behaviour within certain limits.

Tells us: only causes of variation are inherent to the process; stable over time.

Special Causes of Variation

- Are not part of the process
- Affect the outcome only in certain circumstances, not at any time
- A relatively few in number
- Dominate over common causes

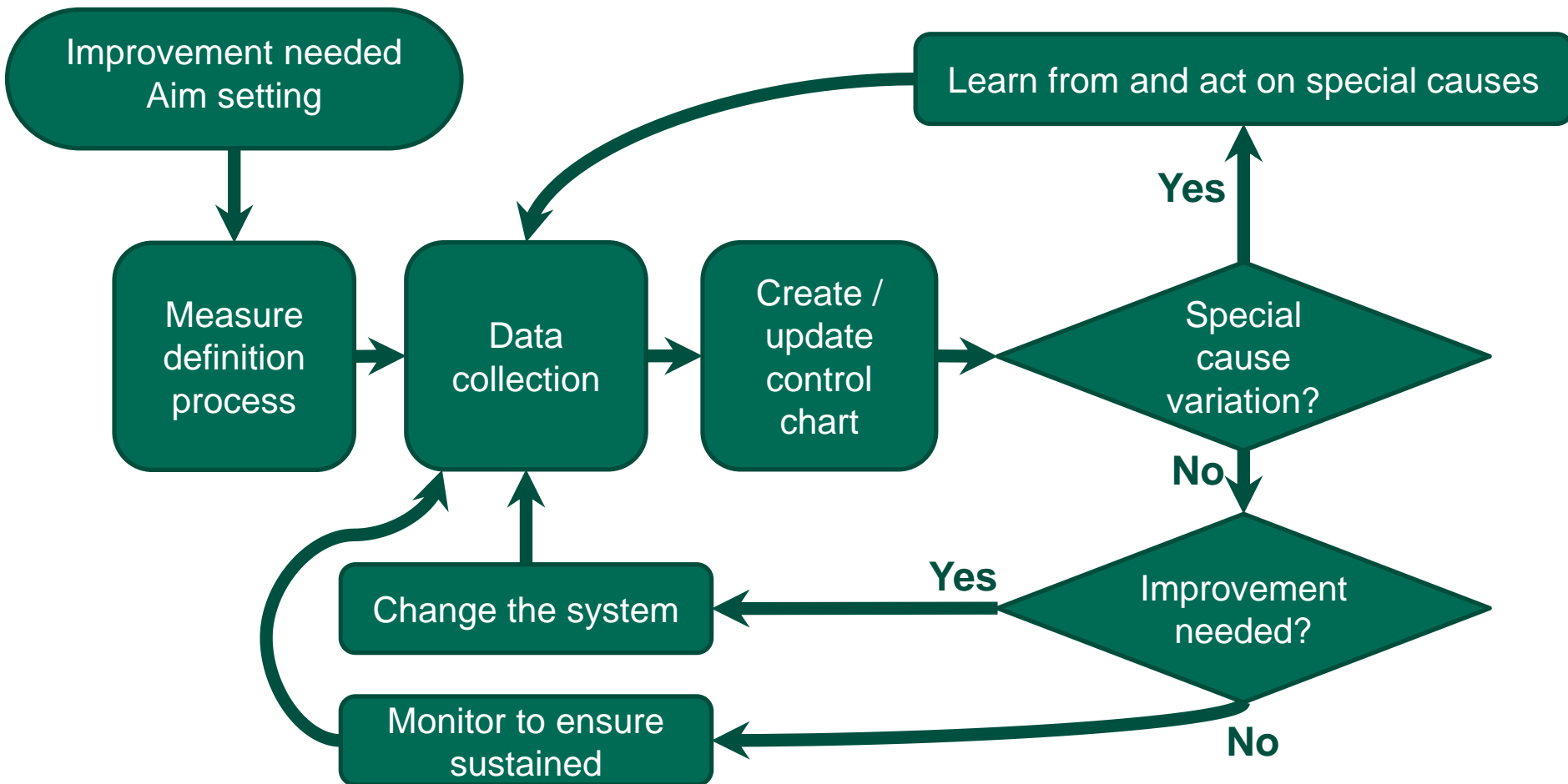
Example: for ambulance response times
– high ED occupancy with increased diverts

Process is not stable over time: said to be *out of statistical control*.

Not possible to predict its behaviour within limits.

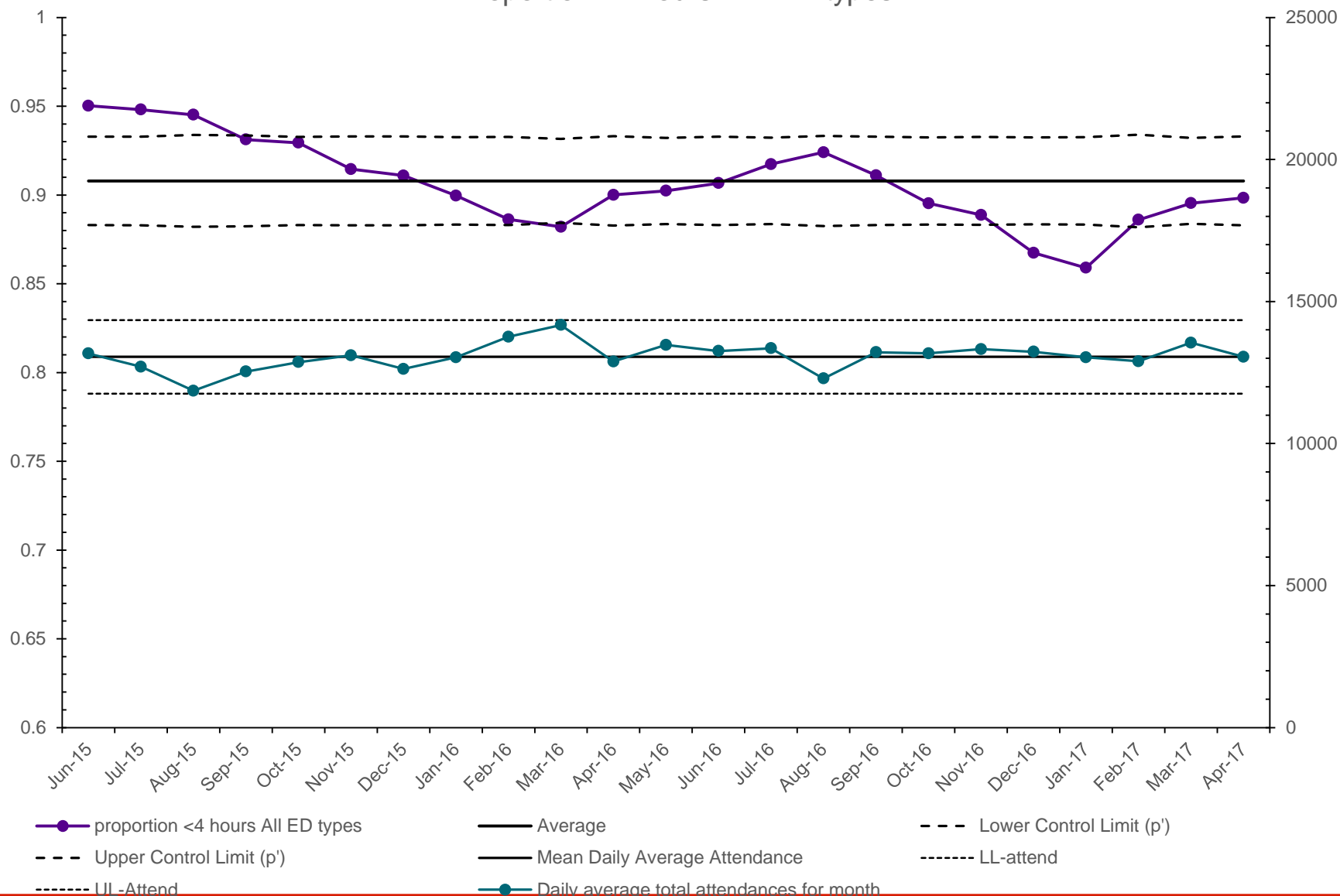
Tells us that the variation over time is unpredictable, and where to look for the cause(s) of this.

Making better decisions

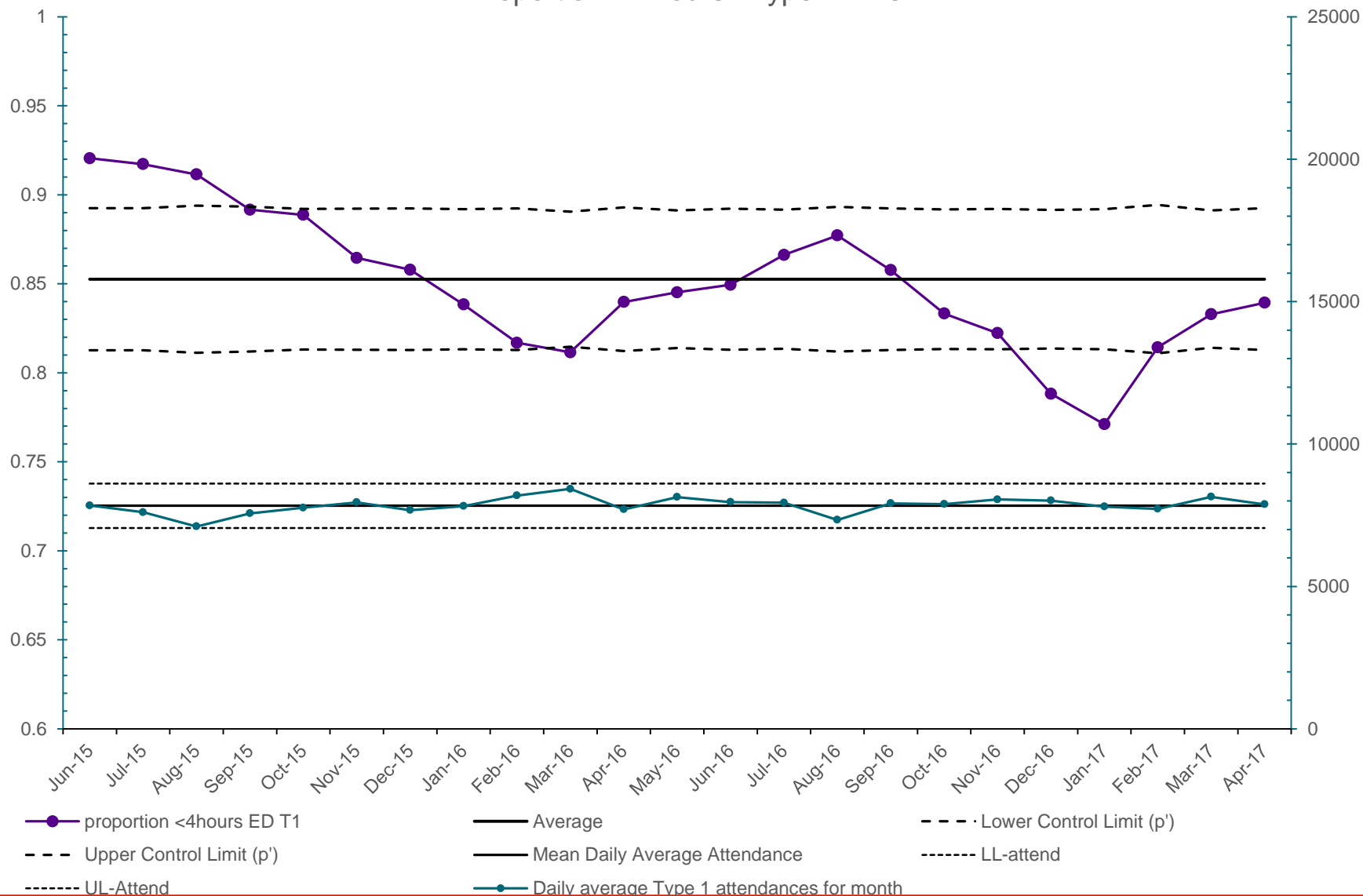


DIAGNOSING THE SYSTEM 2: UNDERSTANDING FLOW

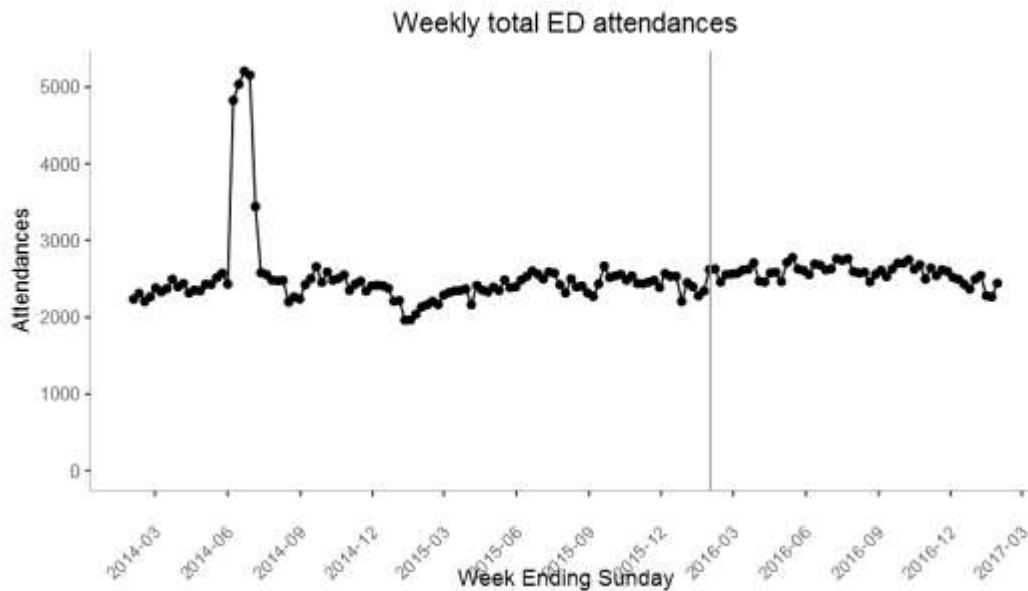
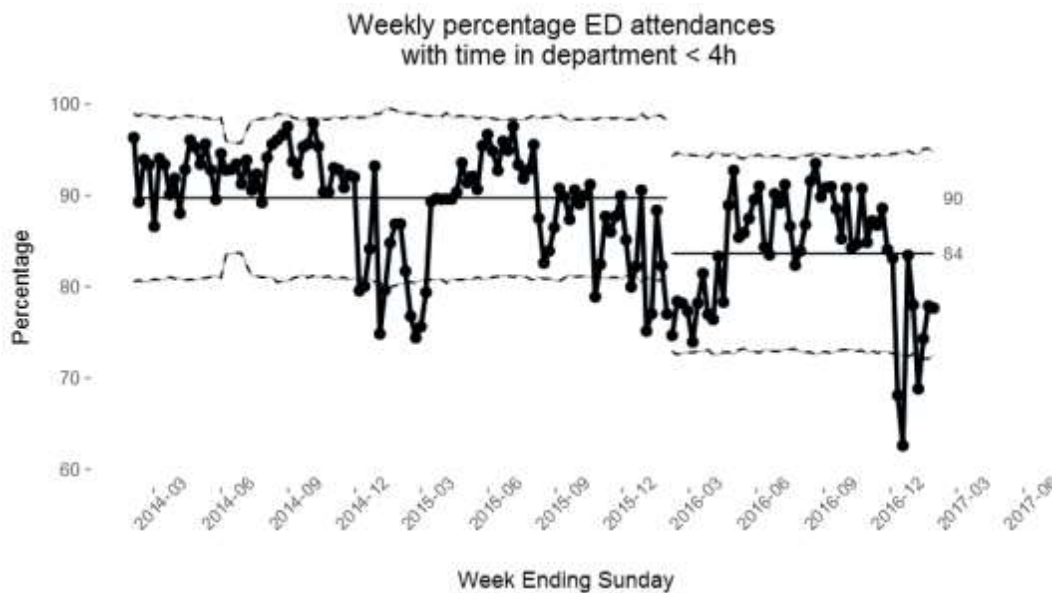
Proportion <4 hours - All ED types



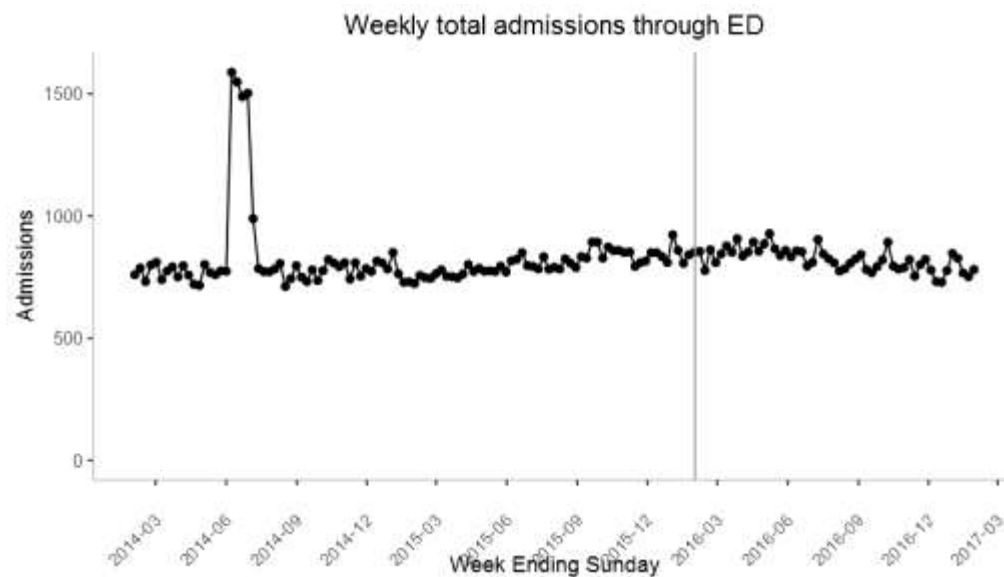
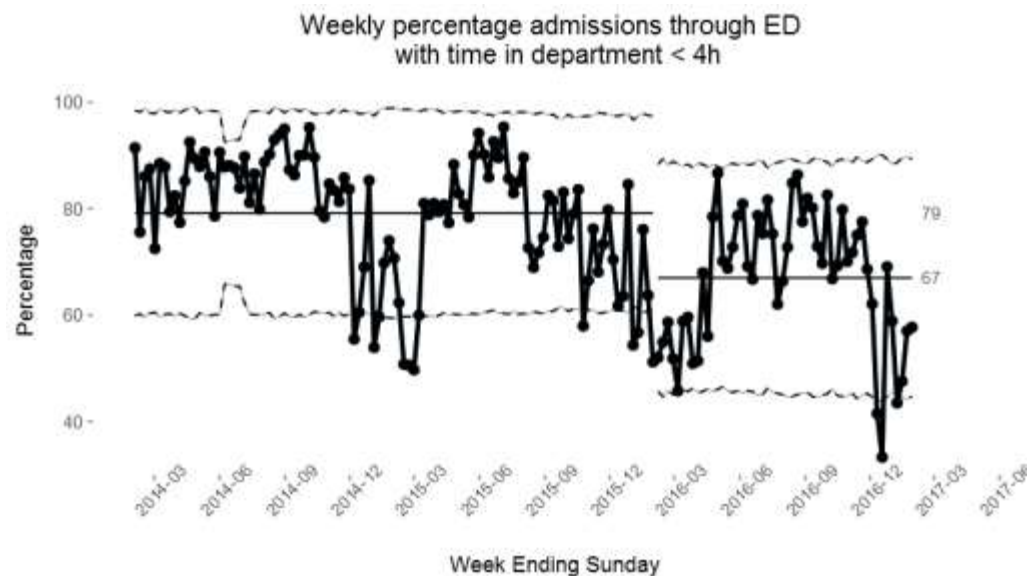
Proportion <4 hours - Type 1 EDs



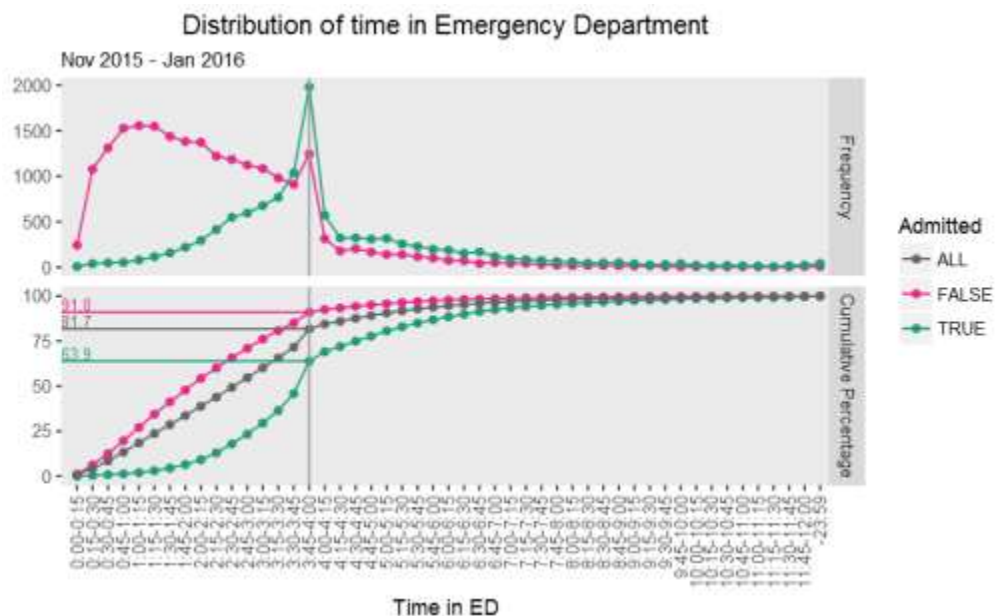
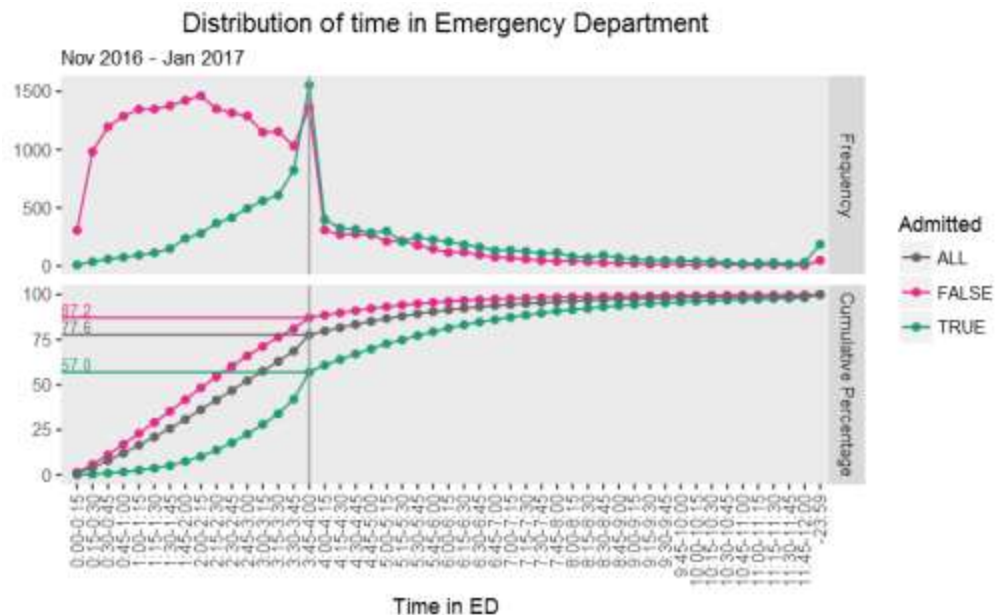
Trust Example 1: Performance over time attendances



Trust Example 1: Performance over time admissions



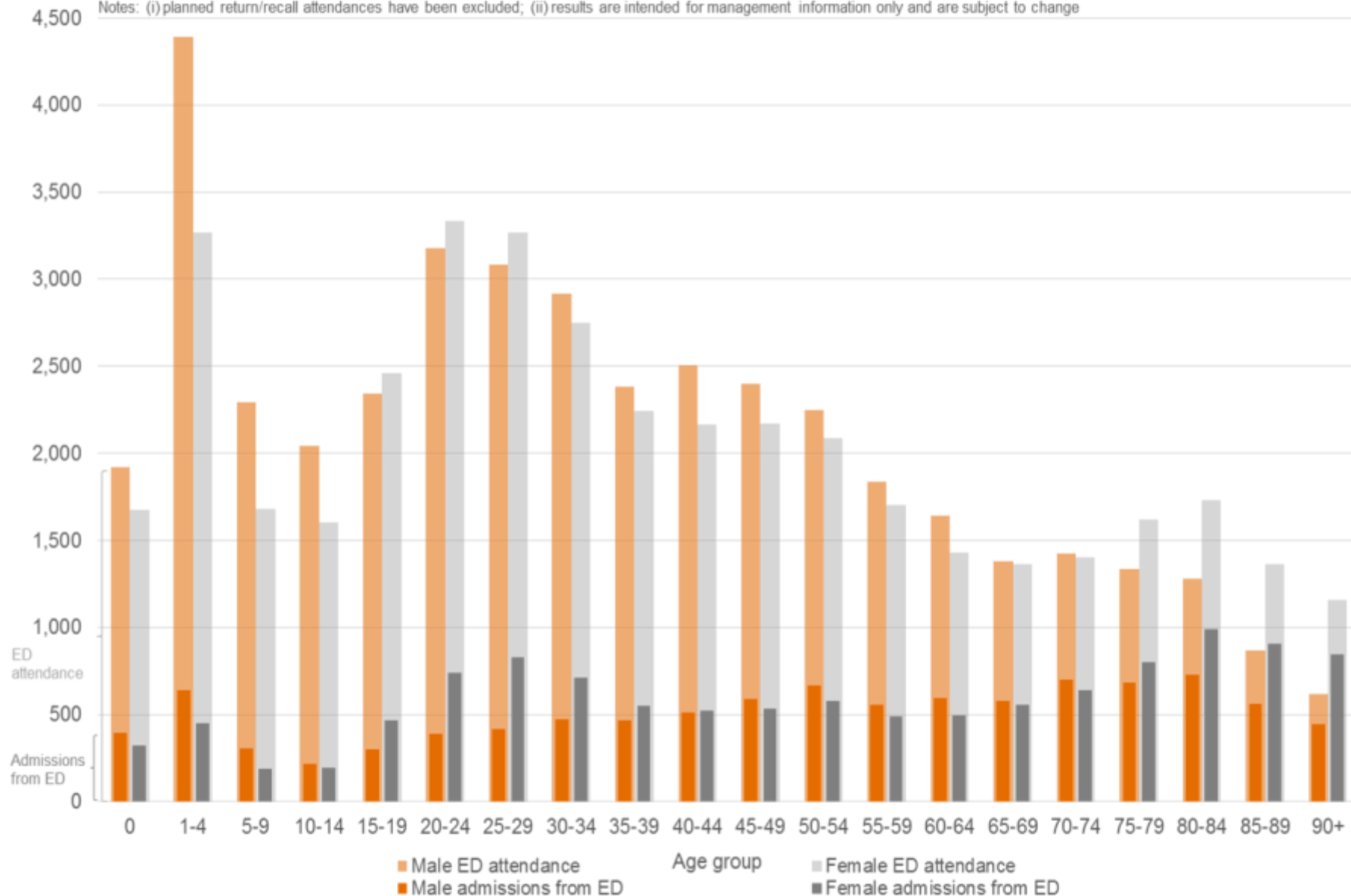
Trust Example 1 Distribution



Hospital 2: unscheduled ED attendance and admissions from ED age-sex profile, year ending Oct 2013

ED attendance and hospital admissions from ED, 29 Oct 2012 - 27 Oct 2013, n

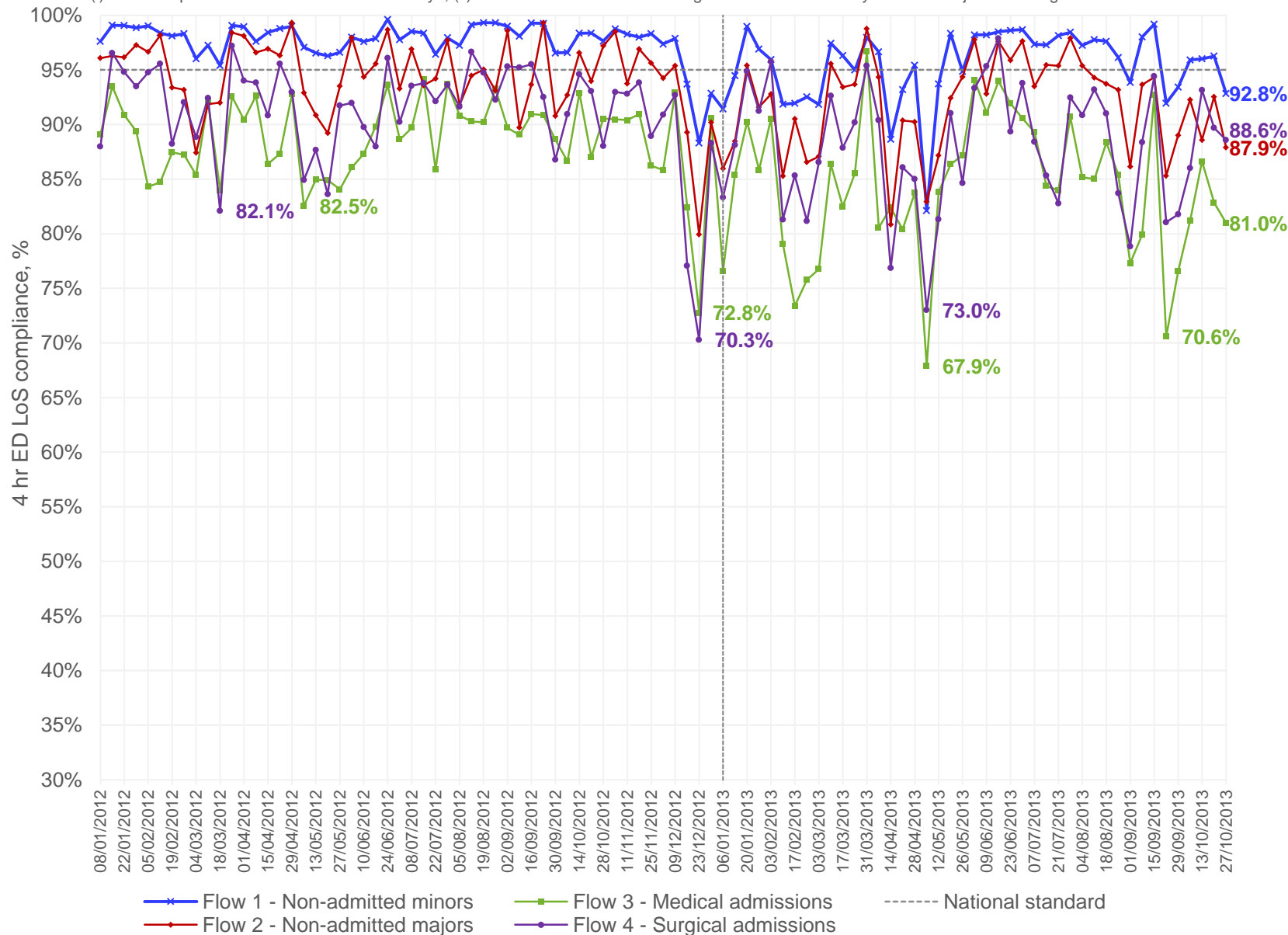
Notes: (i) planned return/recall attendances have been excluded; (ii) results are intended for management information only and are subject to change



Hospital 2: weekly 4 hr emergency access performance, 2 Jan 2012 to 27 Oct 2013

Weekly 4 hr ED LoS compliance, by patient flow group, %

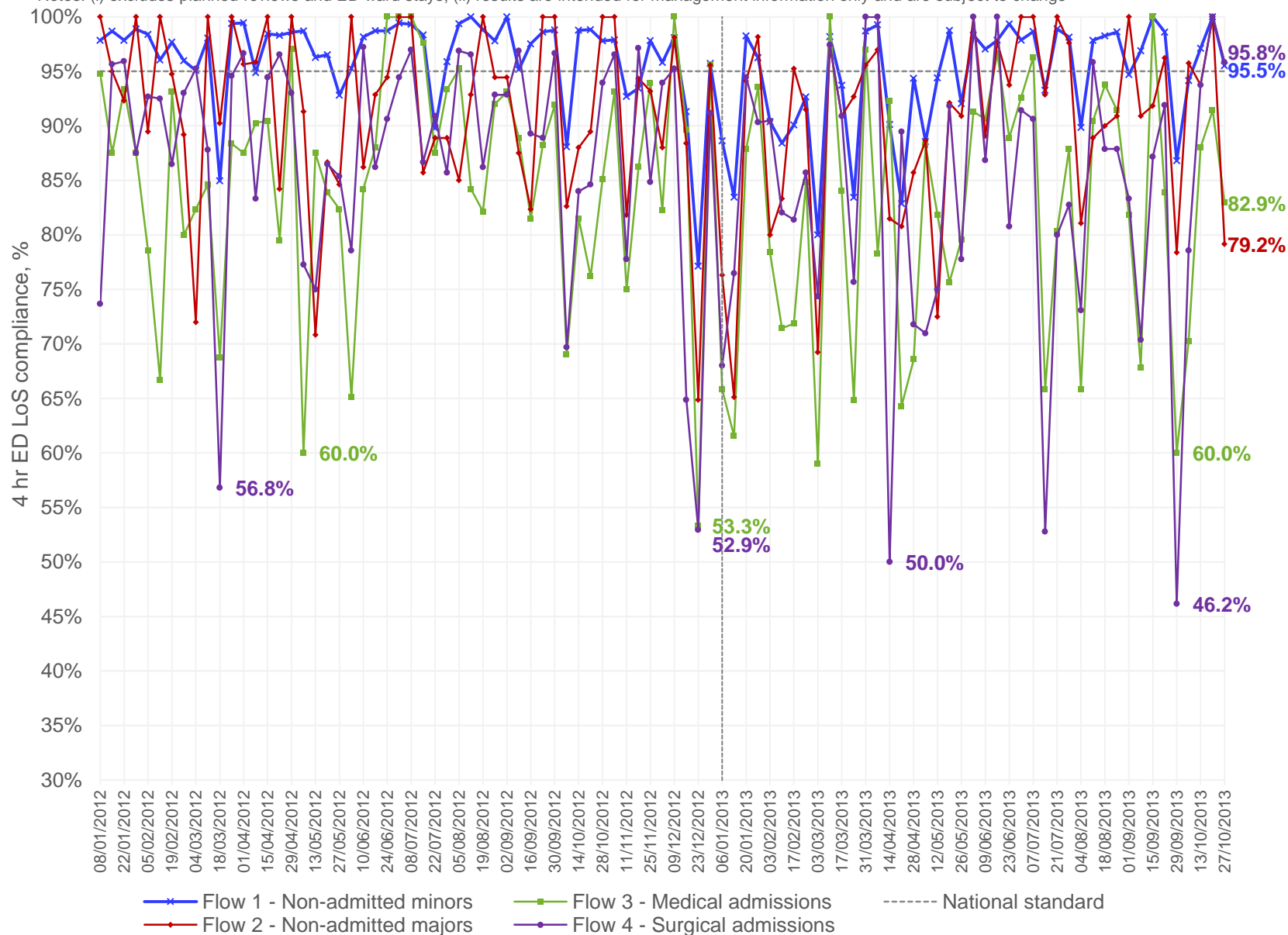
Notes: (i) excludes planned reviews and ED ward stays; (ii) results are intended for management information only and are subject to change



Hospital 2: weekly Monday 4 hr emergency access performance, 2 Jan 2012 to 27 Oct 2013

Weekly Monday 4 hr ED LoS compliance, by patient flow group, %

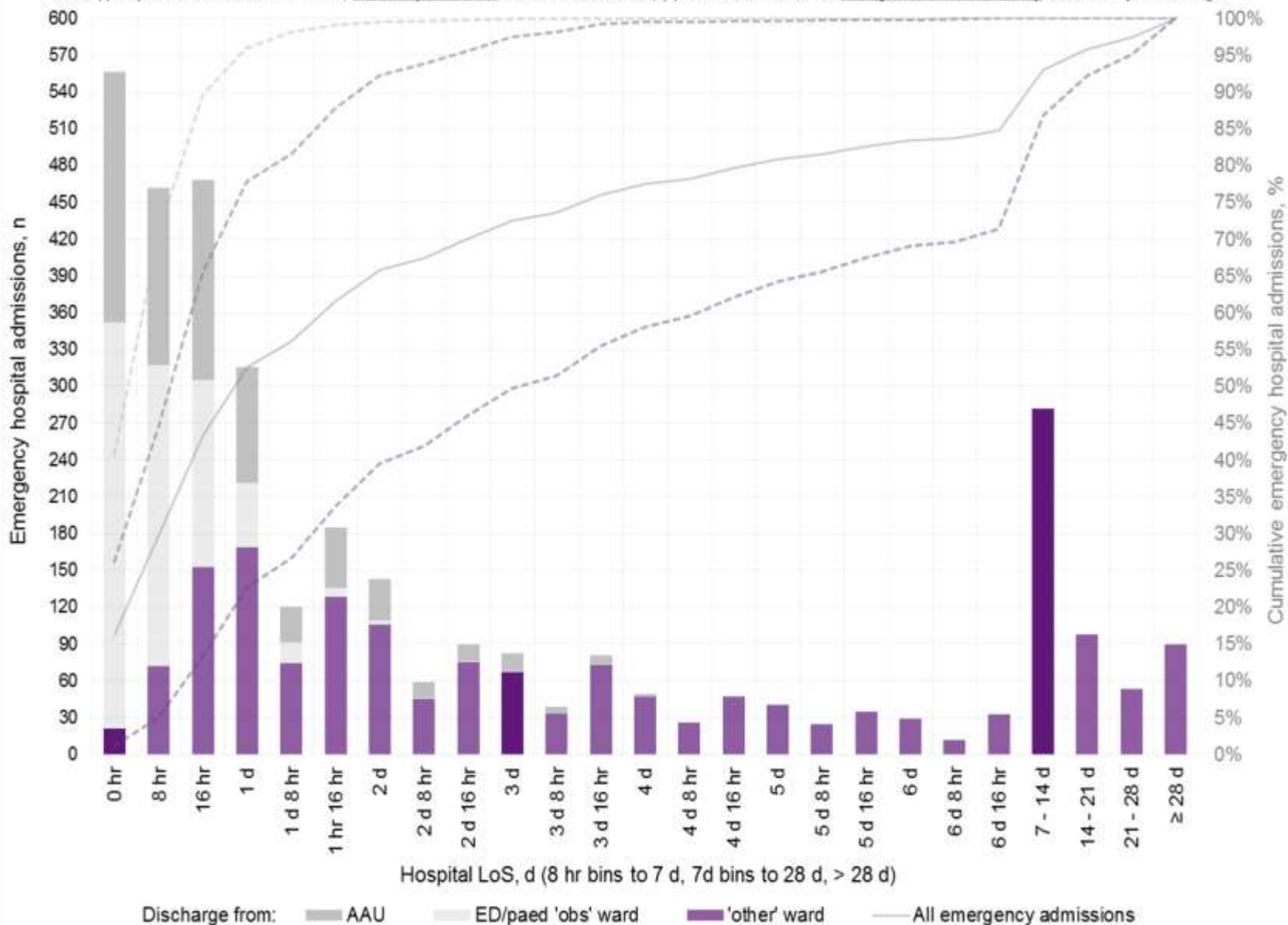
Notes: (i) excludes planned reviews and ED ward stays; (ii) results are intended for management information only and are subject to change



Hospital 2: Hospital LoS distribution for emergency admissions 2 Sep to 27 Oct 2013*

*Hospital discharges 2 Sep to 27 Oct 2013 for patients admitted as an emergency, n; hospital LoS in 8 hr bins to 7 d, 7 d bins to 28 d, ≥ 28 d)

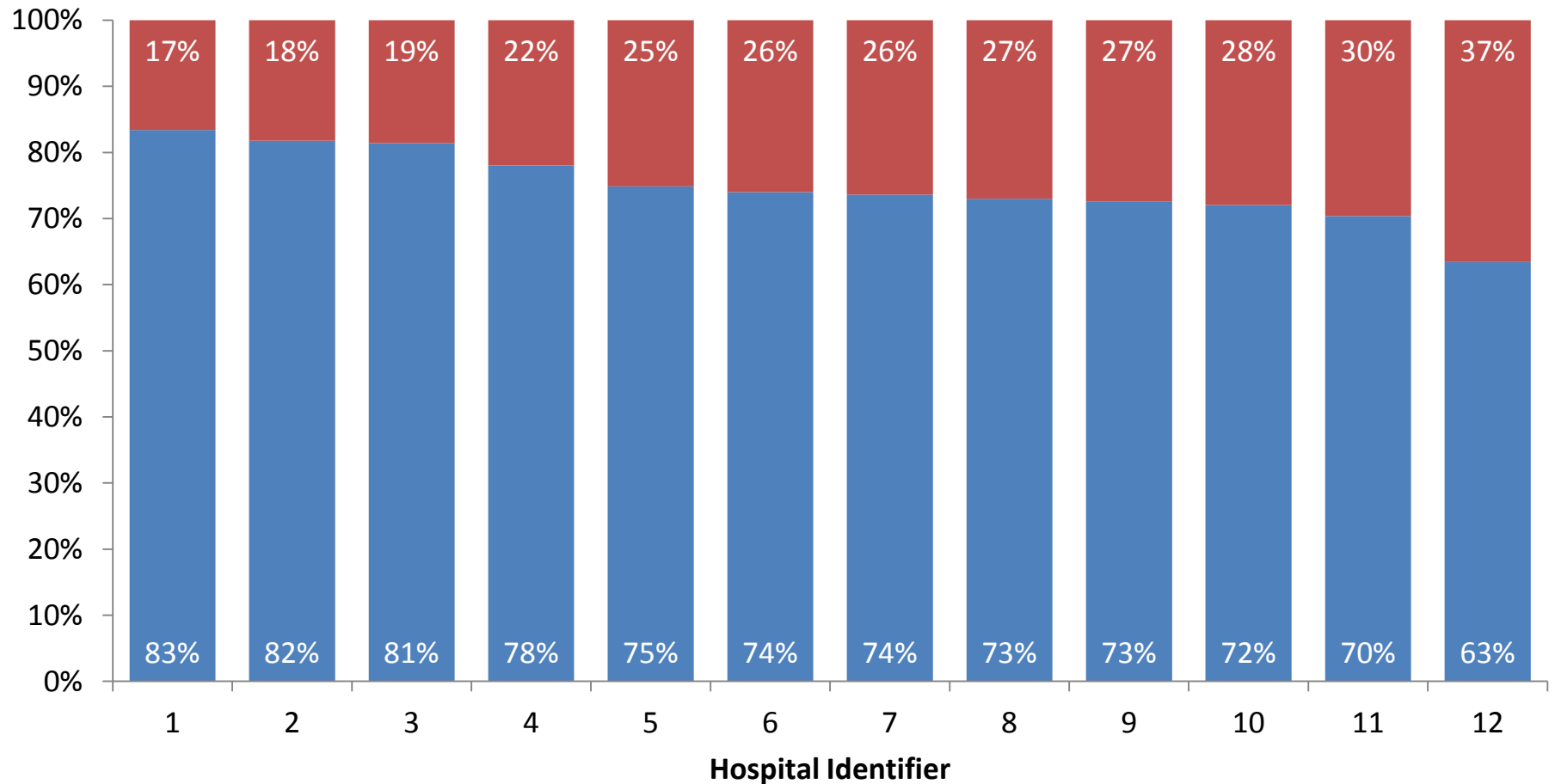
Notes: (i) hospital LoS calculated in minutes, incl. trolleyed ED LoS and excl. transit areas; (ii) results are intended for management information only and are subject to change



NHS Scotland Day of Care Results

■ Patients Meeting Survey Criteria (%)

■ Patients Not Meeting Survey Criteria (%)



NHS Scotland Day of Care Results

Top 3 reasons patients were not discharged split by in-hospital/out-of-hospital, for all patients not meeting the Day-of-Care Survey criteria

Patients (n)

In-hospital

Awaiting consultant decision/review

103

Waiting for allied health professional assessment/treatment

95

Awaiting procedure/investigation/results and not meeting criteria for acute care

64

Total

262

Out-of-hospital

Awaiting community hospital bed

97

Home care support availability/funding

72

Awaiting social work allocation/assessment/completion of assessment

59

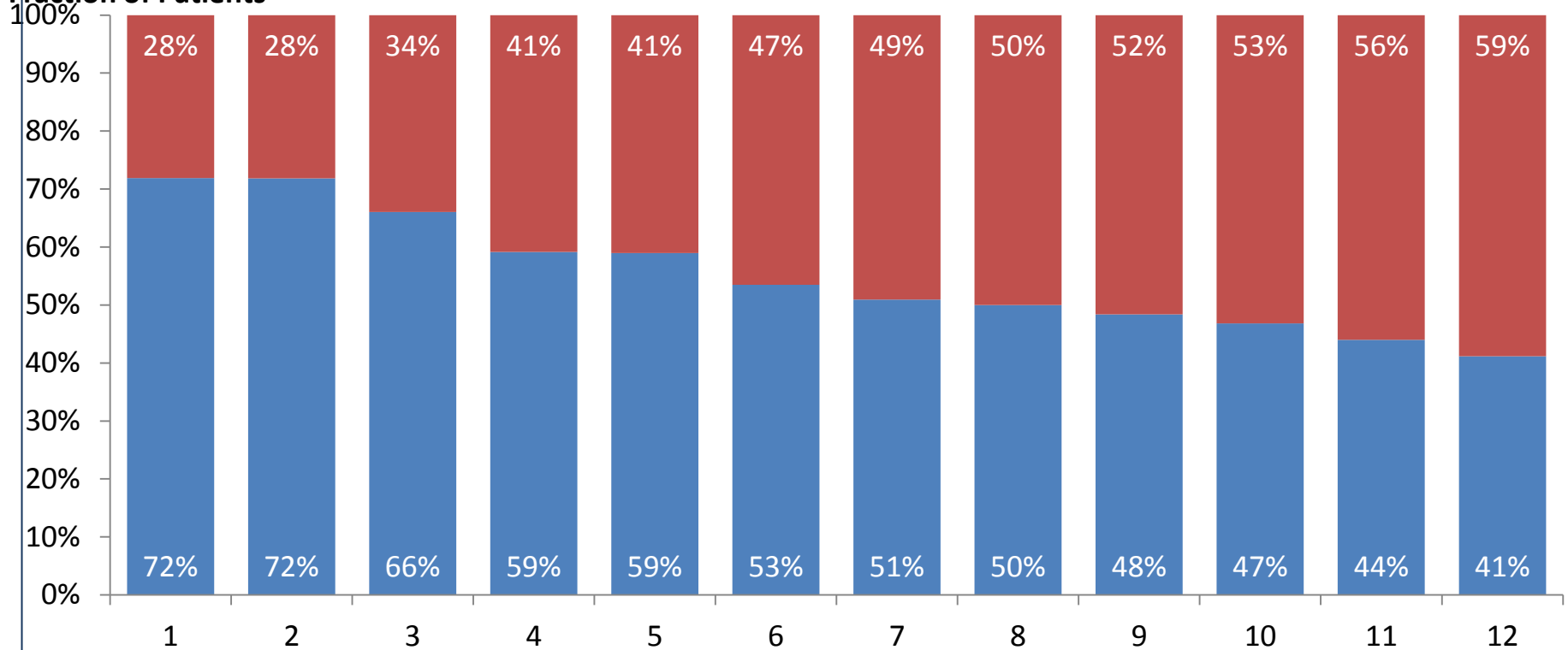
Total

228

NHS Scotland Day of Care Results

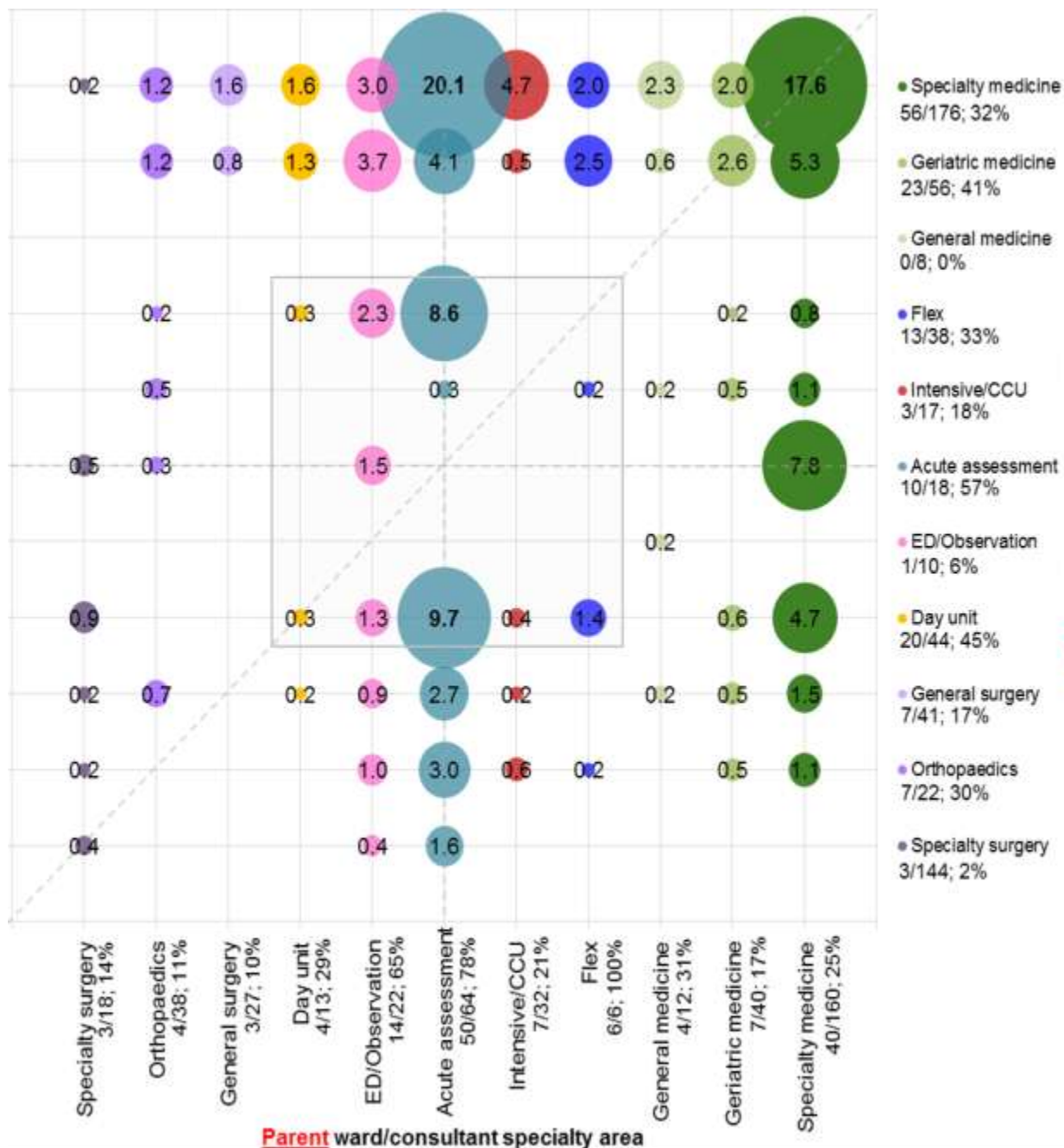
■ Reason Not Discharged Within Hospital Control (%) ■ Reason Not Discharged Outwith Hospital Control (%)

Fraction of Patients



Hospital Identifier

Note: fraction of patients discharged on survey date not shown. Results subject to revision.



Hospital 2: Admitted patient boarding

**Avg boarded patients, by
parent and host ward area/
consultant specialty**

**Mon 7 Jan 2013 to
Sun 3 Mar 2013**

Source: local PAS admitted patient care
and ward event extracts, taken Dec 2013

Ref: Q2014-0005, 28 Jan 2014

Notes:

(i) **presented values are estimates**,
dependent on unvalidated assumptions
concerning standard consultant treatment
footprints and ward specialty groupings
calculated directly from the source data

(ii) results do not include all type-2 boarding
(e.g. patient treatment by HCP within
standard ward footprint, but where patient
condition is unrelated to HCP specialty, e.g.
consequent to delayed discharge or 'full
capacity protocol')

(iii) maternity activity has been excluded

(iv) results are intended for **management
information only** and are subject to
change

Overall average:

141.5 Boarded

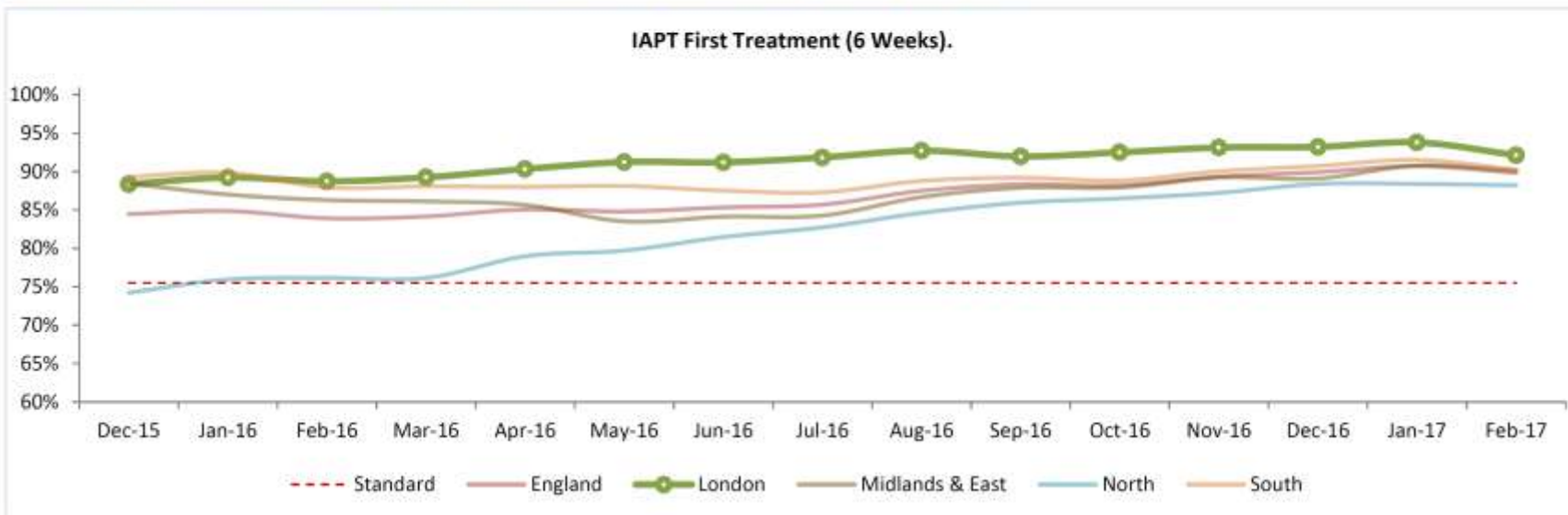
291.8 Non-boarded

433.4 Total occupied

32.7% boarded

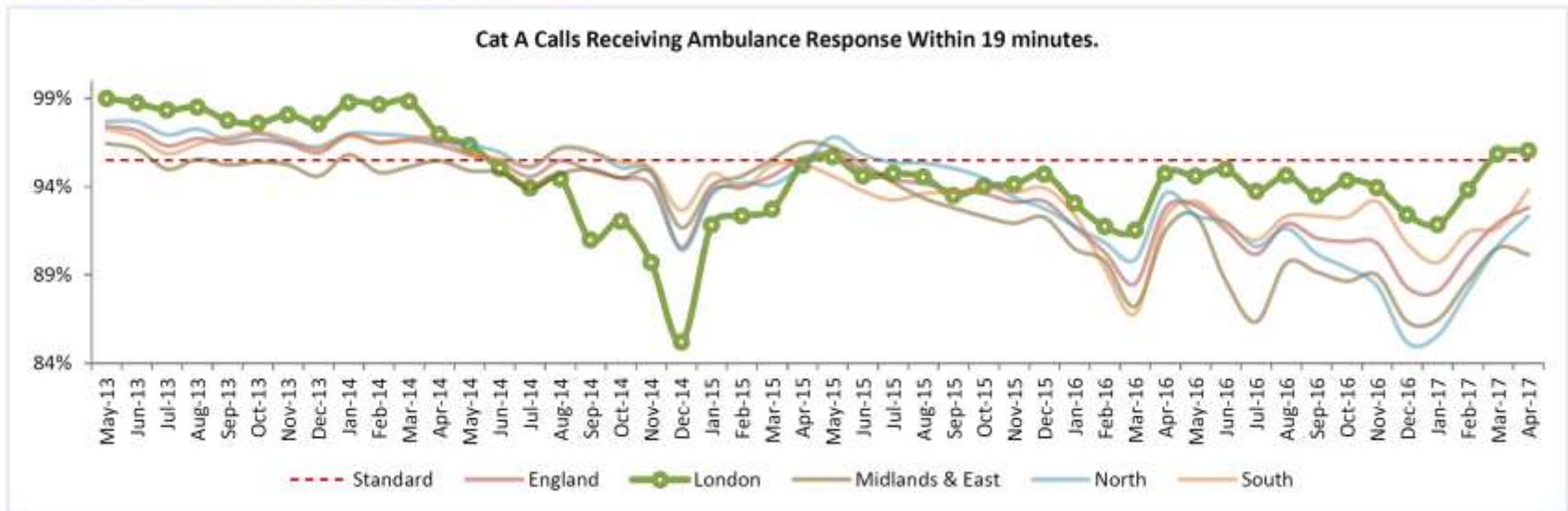
IAPT 6 Weeks

The number of people who had their first treatment appointment within six weeks of referral in the reporting period against the number of people who had their first treatment appointment in the reporting period, the measure from April 2016 will be 75%



Ambulance 19 Minutes

Category A (Red 1 and Red 2) Presenting conditions which may be immediately life threatening and should receive an ambulance response at the scene within 19 minutes irrespective of location in 95% of cases



Exercise

Can you access this type of information in your organisation? If not, what do you use instead?

What can you do to progress toward better information for improvement?

- Who can help you get the information you need?
- Can we help?

Conclusions

- Data vs knowledge useful for improvement
- Qualitative and quantitative ways of knowing
- Measuring...
 - at key points
 - across the system
- Understanding variation is key – making better decisions
 - Two common mistakes
- The feedback loop – know your system!

Selected References

Provost LP, Murray SK. 2011. *The Health Care Data Guide: Learning from Data for Improvement*. Jossey-Bass. ISBN 978-0-470-90258-5.

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Mohammed MA. 2004. Using statistical process control to improve the quality of health care.

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Thor J, Lundberg J, Ask J, Olsson J, Carli C, Pukk Härenstam C, Brommels M. 2007. Application of statistical process control in healthcare improvement: systematic review. *Qual Saf Health Care* 16:387-399.

Provost LP. 2011. Analytical studies: a framework for quality improvement design and analysis, *BMJ Qual Saf* 2011; 20 (Suppl. 1) doi:10.1136/bmjqs.2011.051557



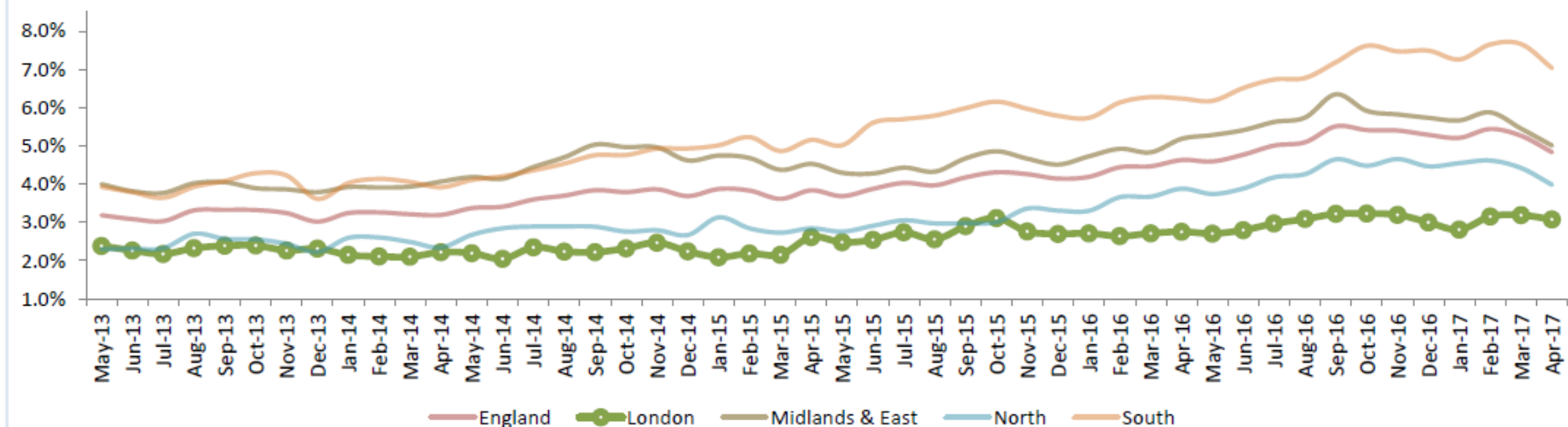
Collaboration for Leadership in Applied Health Research and Care Northwest London

ADDITIONAL SLIDES

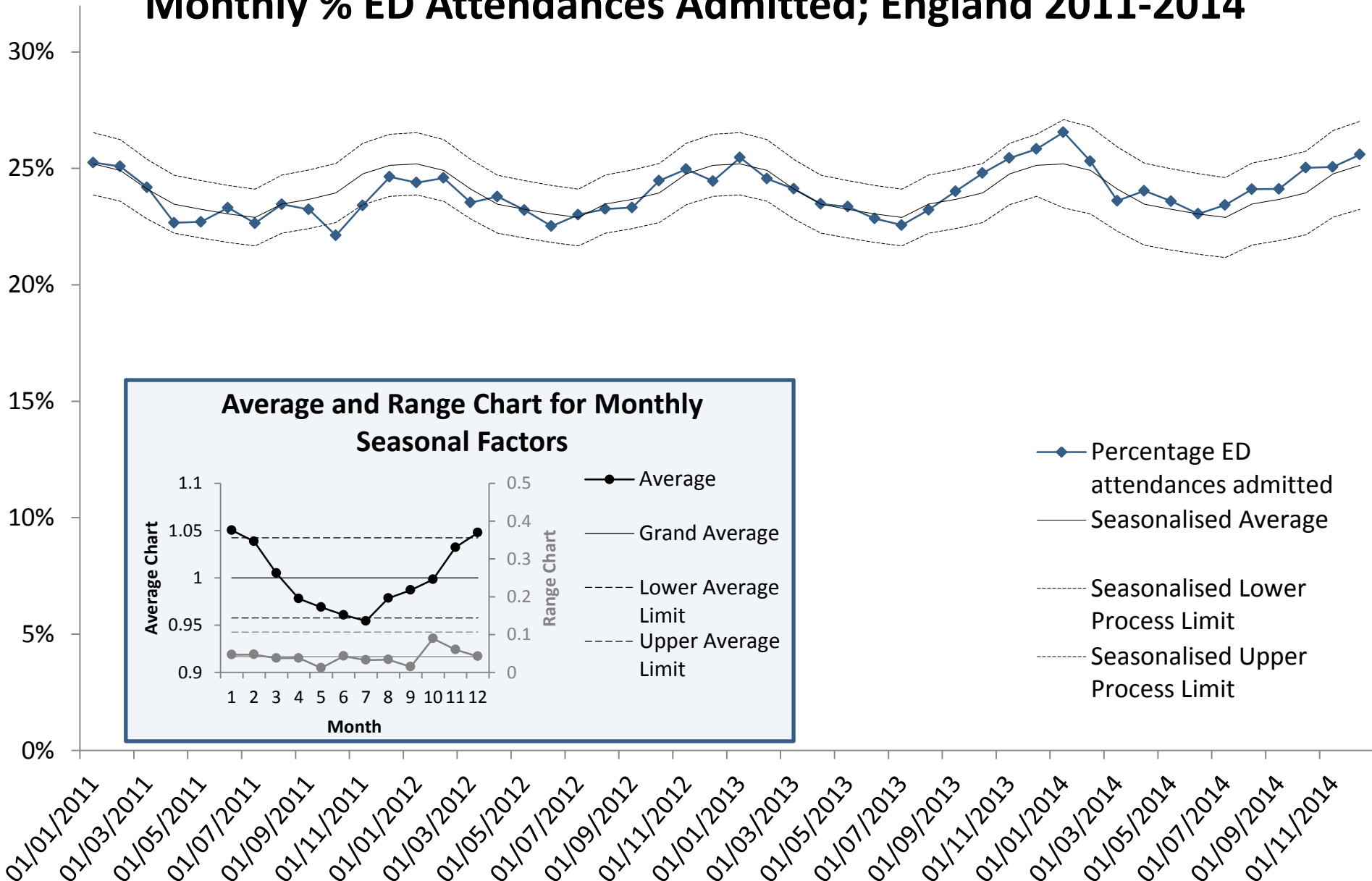
May be useful if questions asked or for additional discussion over coffee!

A delayed transfer of care from acute or non-acute provider (including community and mental health) care occurs when a patient is ready to depart from such care and is still occupying a bed

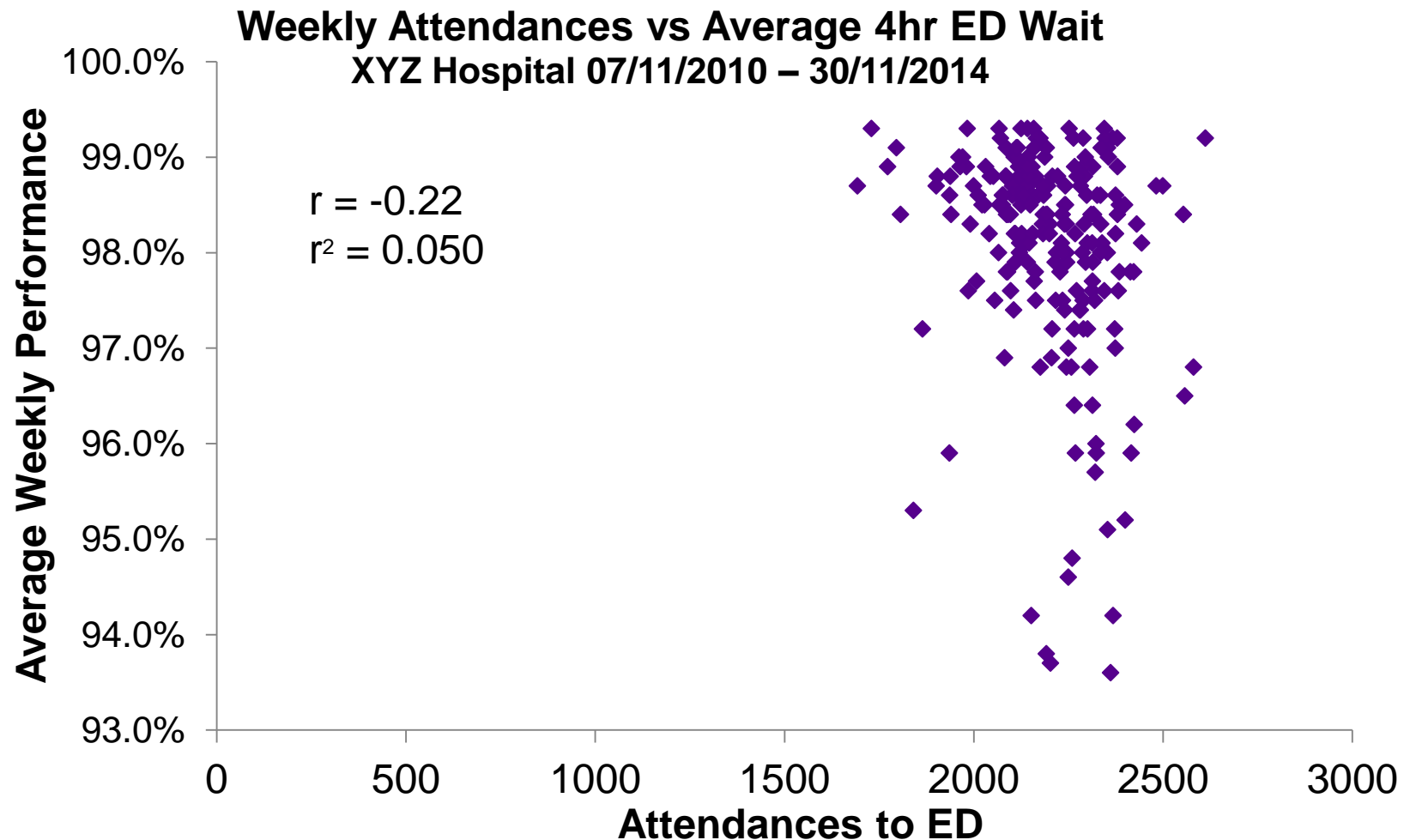
Delayed Patients Per Month as a Percentage of Occupied Beds.



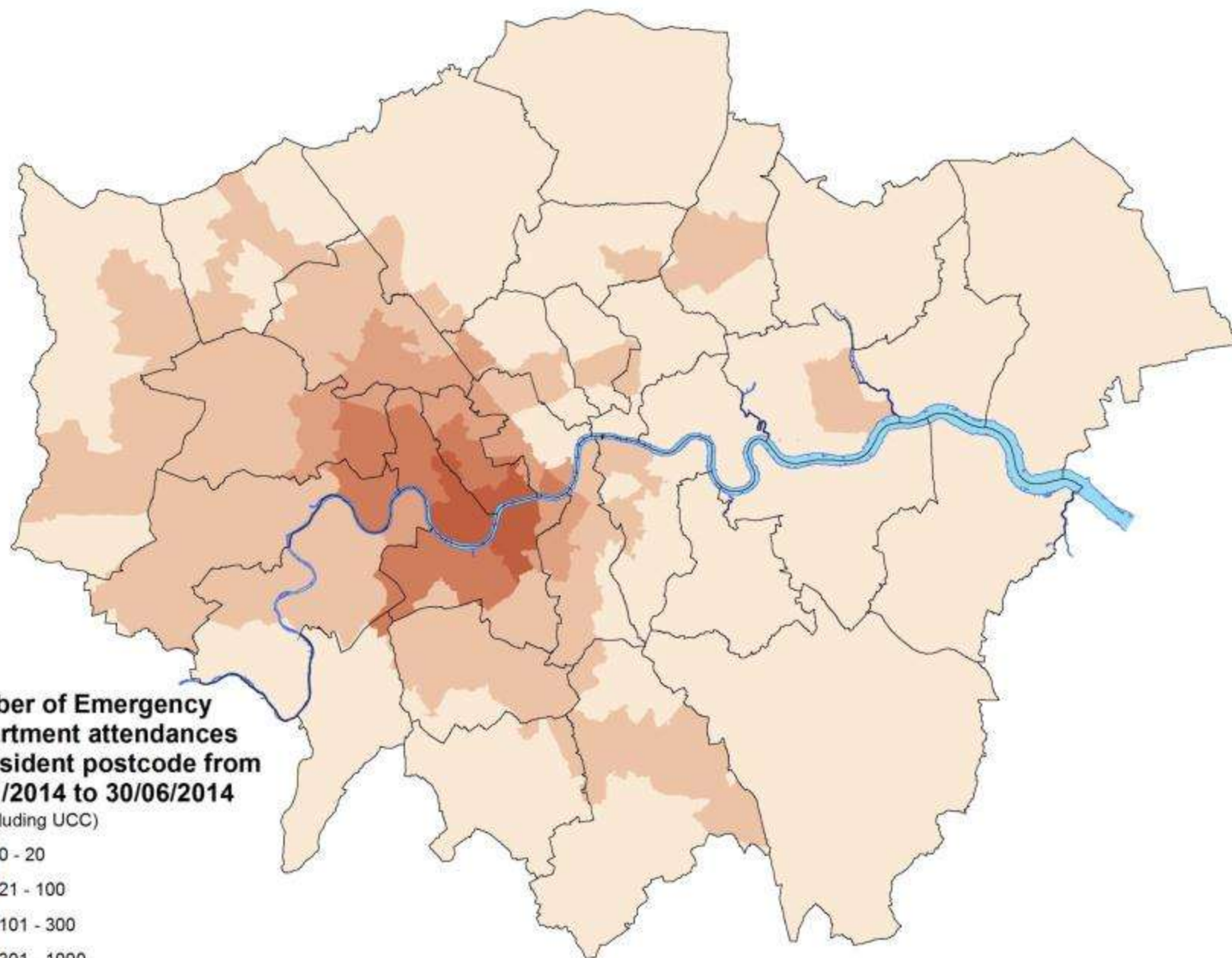
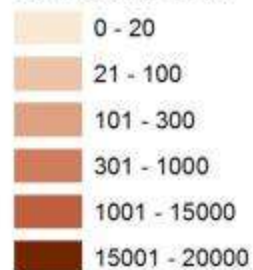
Monthly % ED Attendances Admitted; England 2011-2014



Relationships between variables



**Number of Emergency
Department attendances
by resident postcode from
01/01/2014 to 30/06/2014**
(not including UCC)



NIHR CLAHRC
Northwest London

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NIHR CLAHRC Northwest London. 18/09/2014.

Why do we measure?

Research

Improvement

**The answer to this
question will guide
our entire
measurement
journey**



Judgement

The 3 reasons for measurement

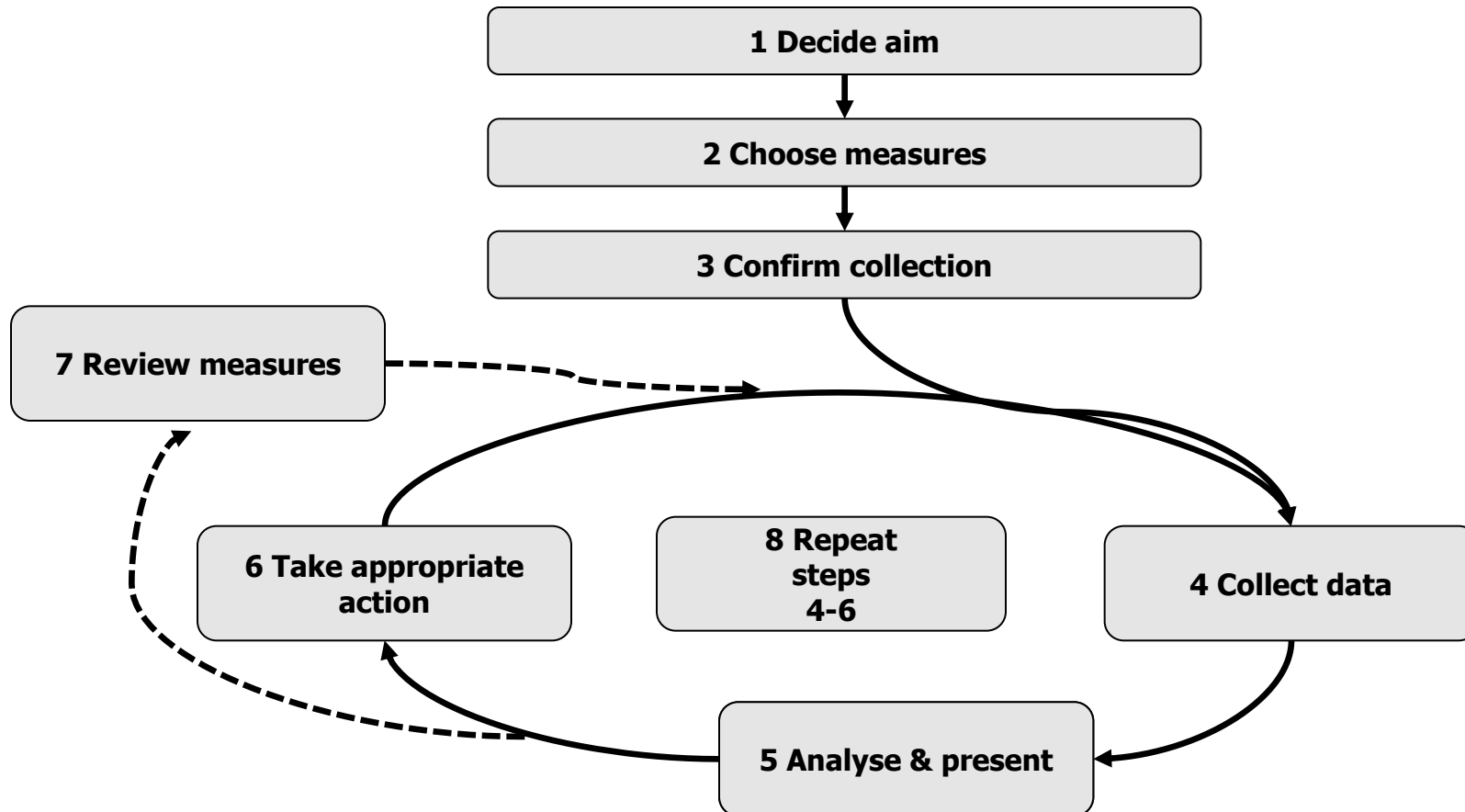
Characteristic	Judgement	Research	Improvement
Aim	Achievement of target	New knowledge	Improvement of service
Testing Strategy	No tests	One large test	Sequential tests
Sample Size	Obtain 100% of available, relevant data	“Just in case” data	“Just enough” data, small sequential samples
Type of hypothesis	No hypothesis	Fixed hypothesis	Hypothesis flexible, changes as learning takes place
Variation (Bias)	Adjust measures to reduce variation	Design to eliminate unwanted variation	Accept consistent variation
Determining if a change is an improvement	No change focus	Statistical tests (t-test, F-test, chi square), p values	Run charts or Shewhart control charts

Source: Solberg et al 1997

Measurement for Improvement

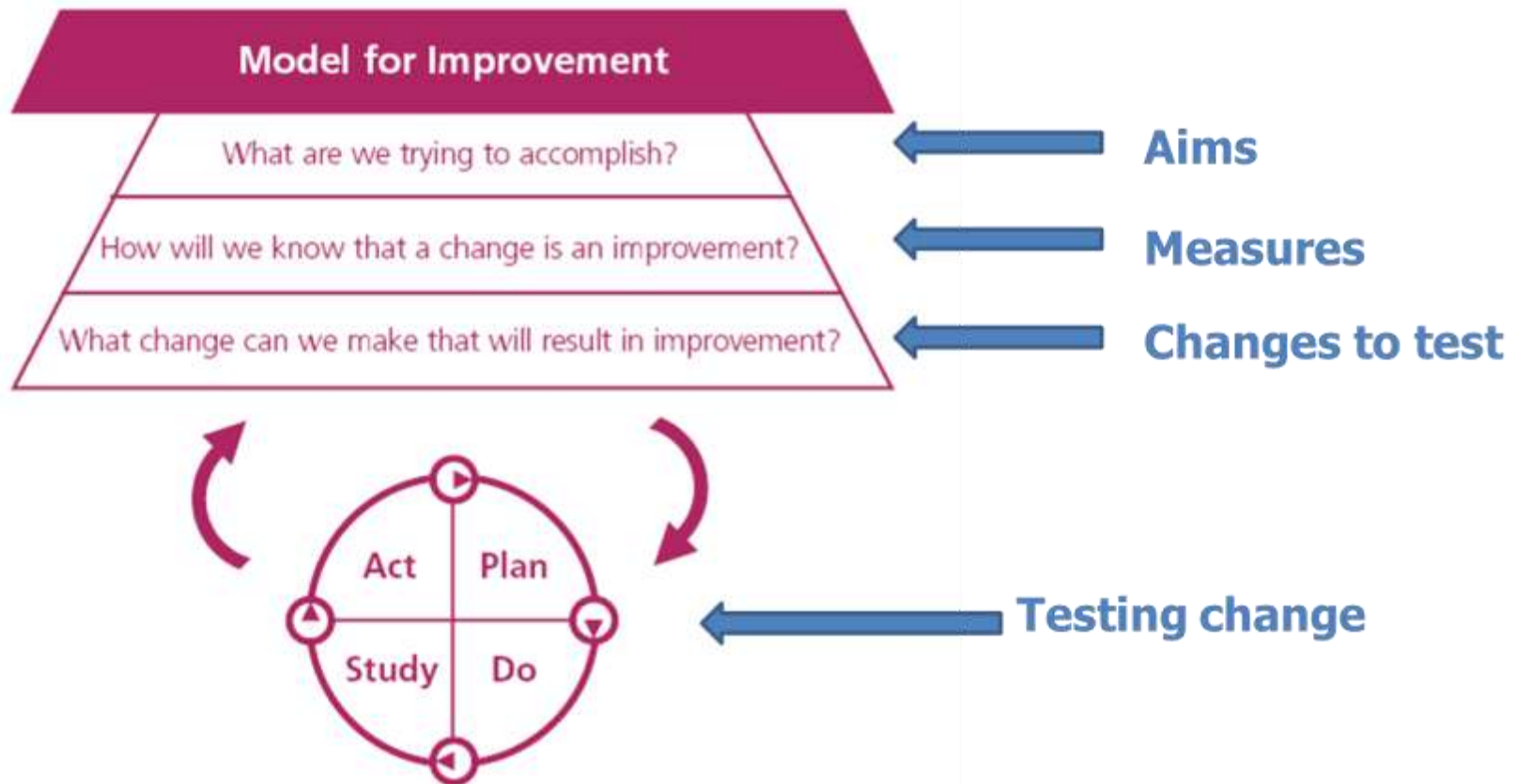
A few simple and specific measures,
linked to your objectives and aims, and
available in real time
to demonstrate whether changes are making
improvements.

The measurement cycle

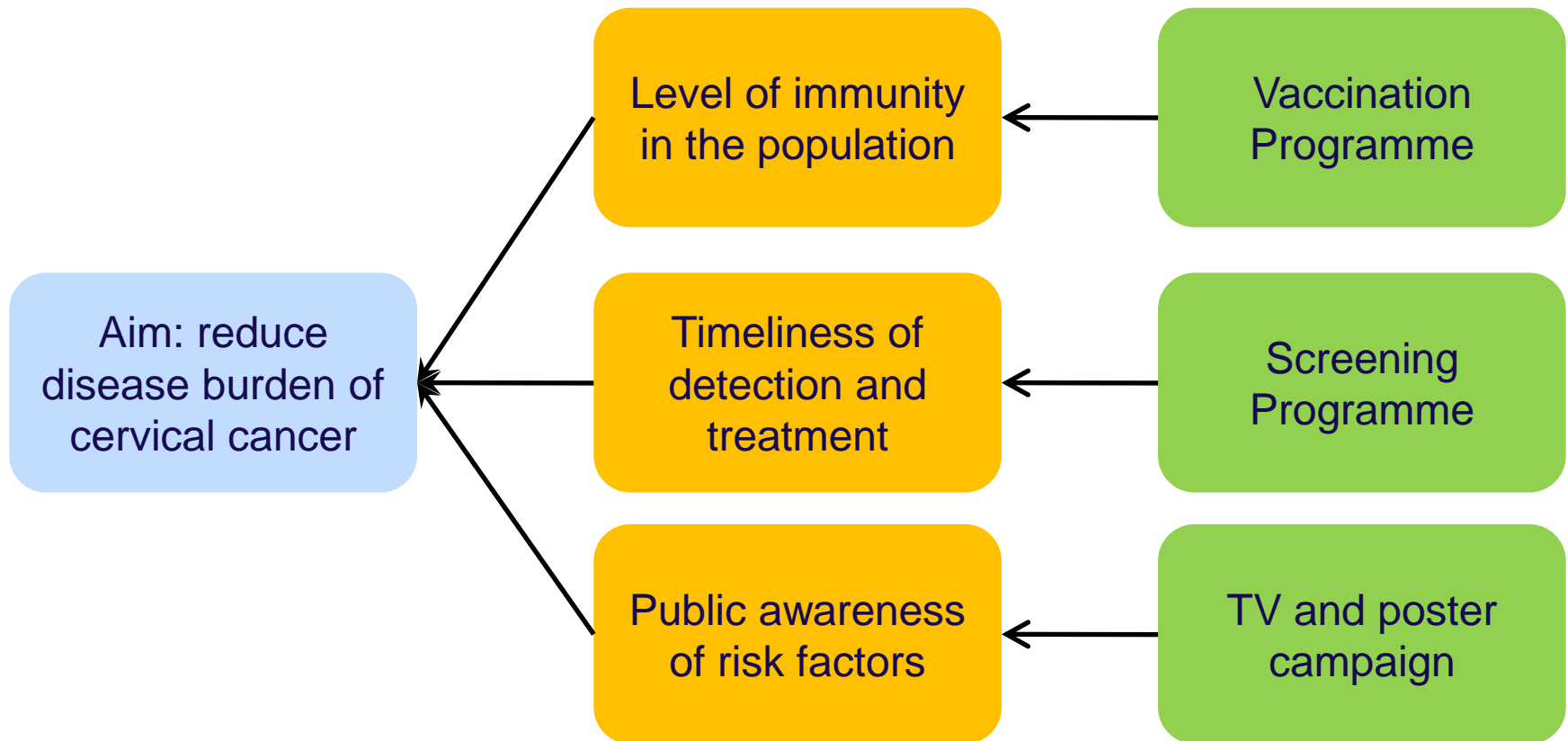


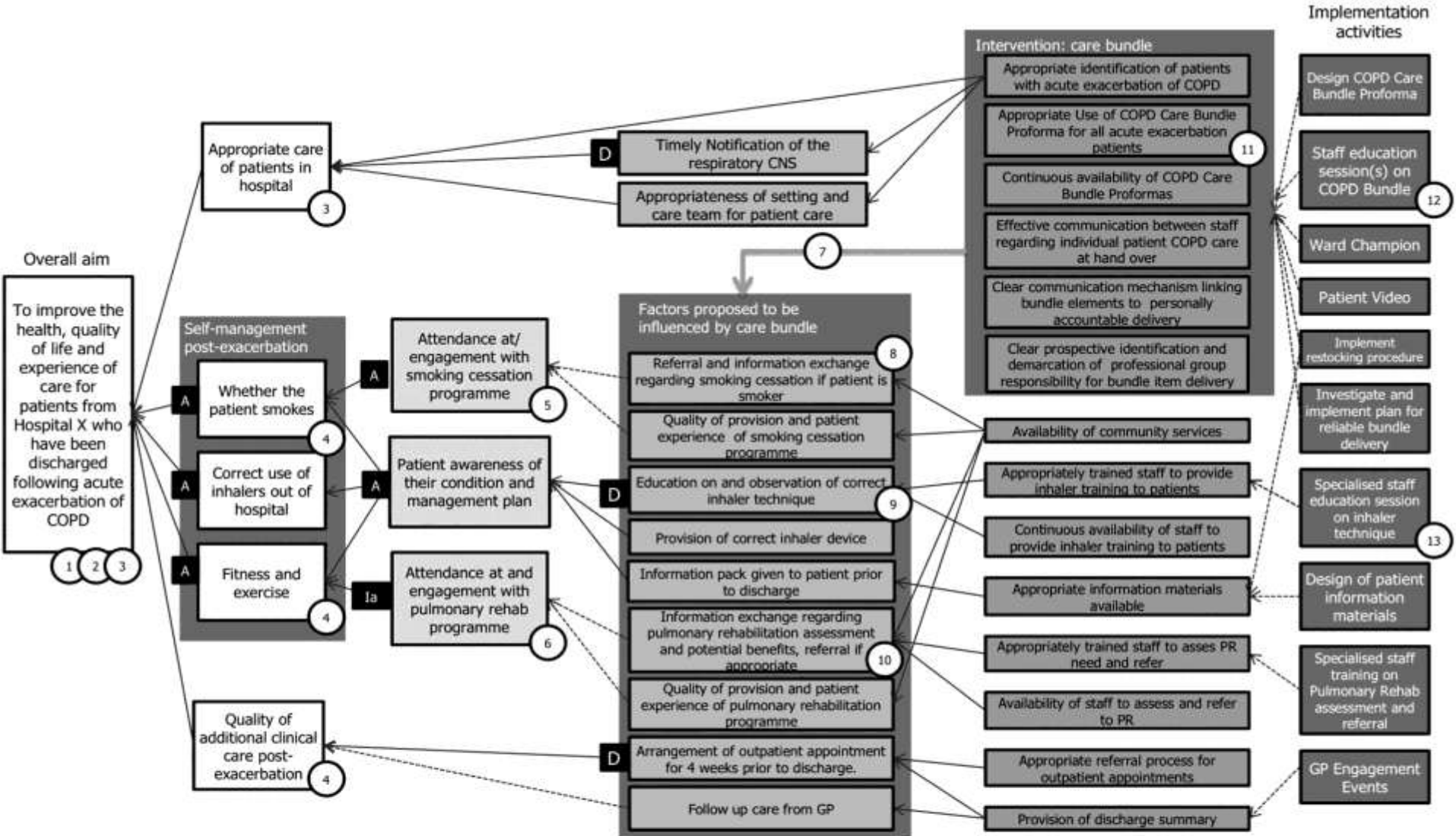
Model for improvement (including PDSA)

- Outlines key questions to reflect on to make improvement

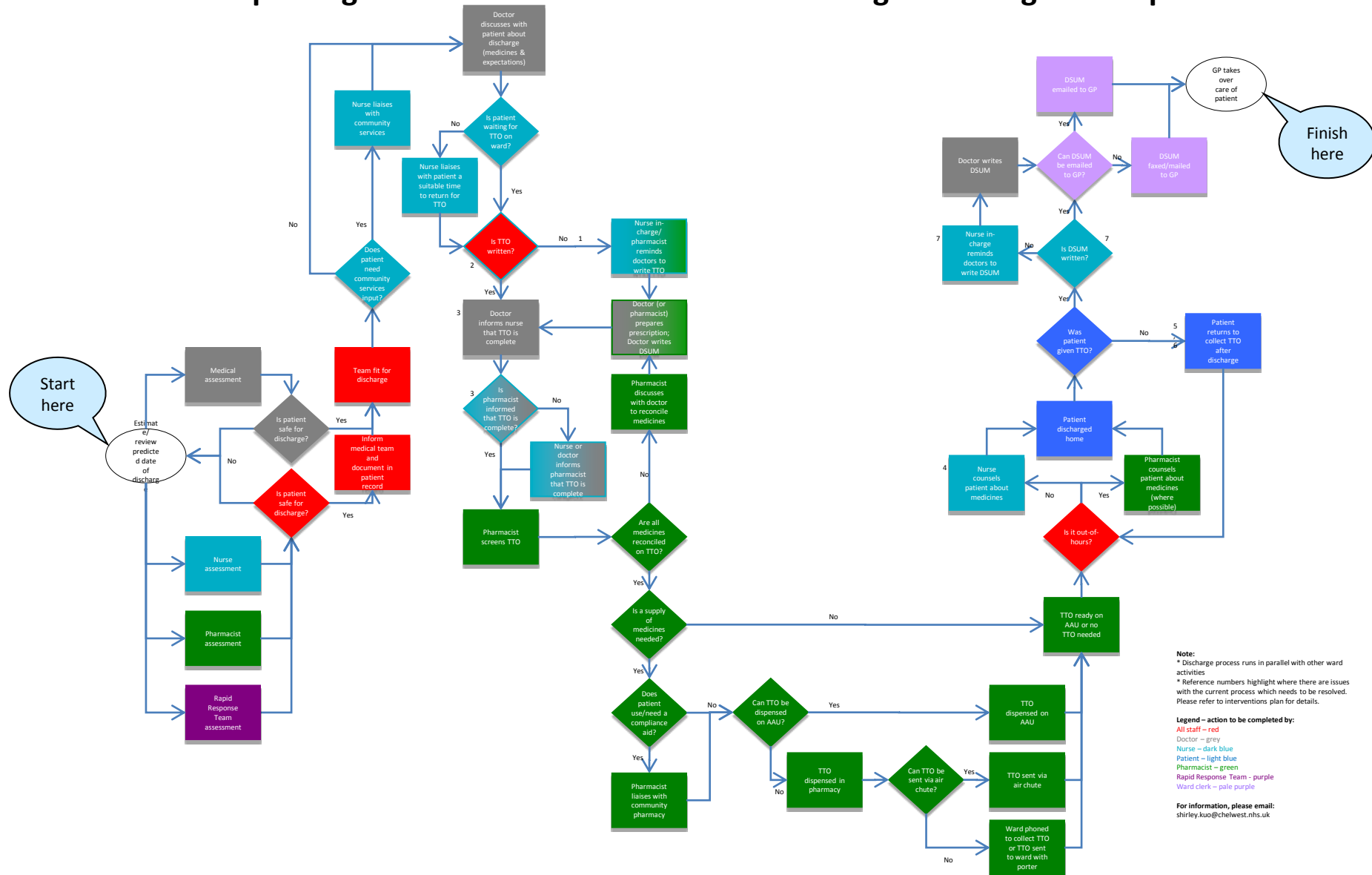


Action Effect Diagram Example





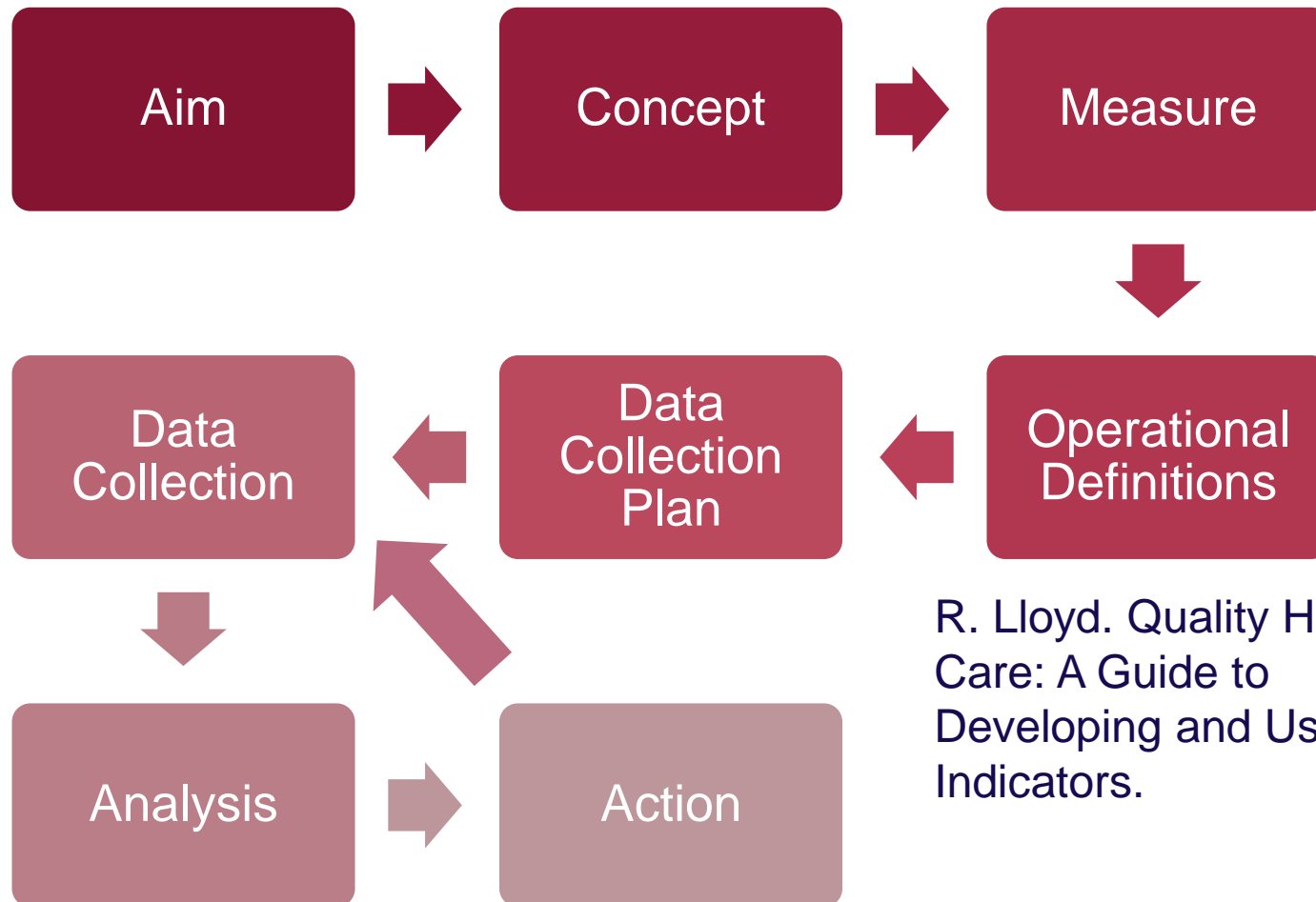
Improving Medication Reconciliation at Discharge – Closing the Loop



Section 4

OPERATIONAL DEFINITIONS

What to measure?



R. Lloyd. Quality Health
Care: A Guide to
Developing and Using
Indicators.

Operational Definition of Measures

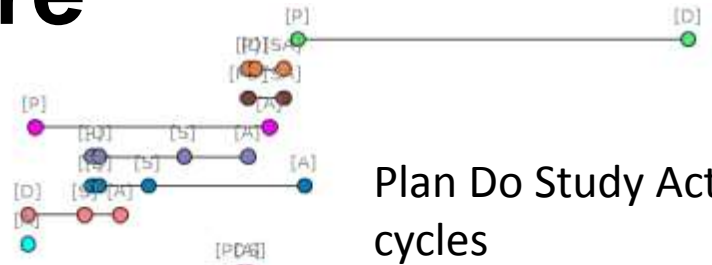
R. Lloyd makes the following definition:

An operational definition is a description, in quantifiable terms, of what to measure and the specific steps needed to measure it consistently.

A good operational definition:

- Gives communicable meaning to a concept or idea
- Is clear and unambiguous
- Specifies measurement method, procedures & equipment
- Provides decision-making criteria when necessary
- Enables consistency in data collection

Web Improvement Support for Healthcare



Plan Do Study Act
cycles

Comments -
context

Model-driven approach to data collection and reporting for quality improvement

Vasa Curcin[✉], Thomas Woodcock[✉], Alan J. Poots[✉], Azeem Majeed[✉], Derek Bell[✉]

[Show more](#)

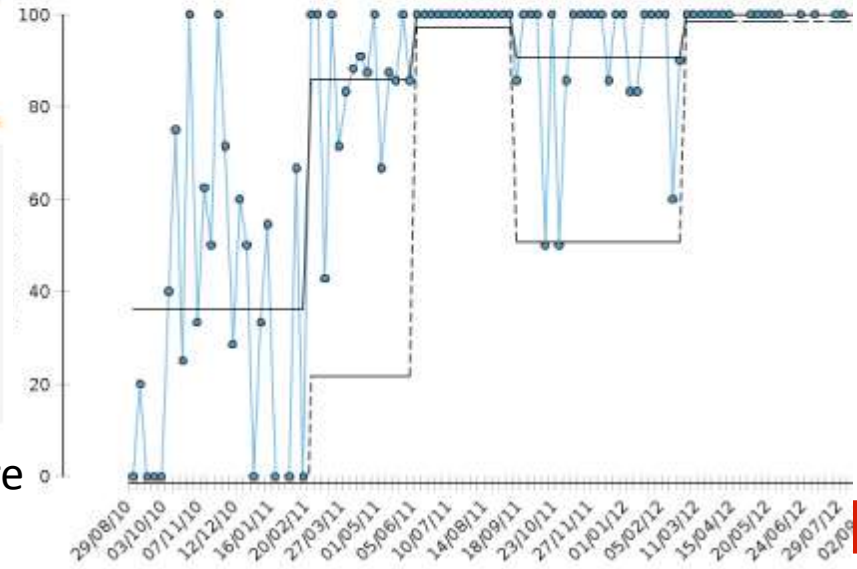
doi:10.1016/j.jbi.2014.04.014 [Get rights and content](#)

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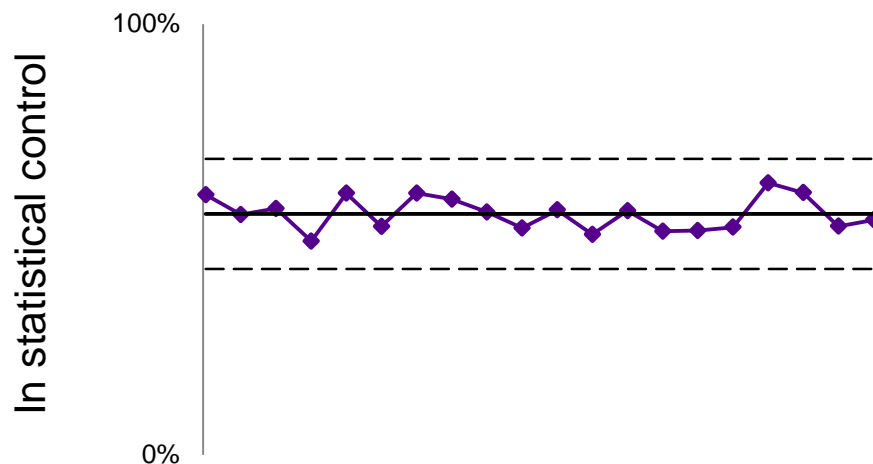
Highlights

- Addressing the challenge of the second translational gap is key to improving healthcare processes.
- Data-driven methodologies improve likelihood of success.
- We propose the Improvement Data Model (IDM) for data collection and reporting for local improvement.
- WISH, a prototype software tool based on IDM is used by over 600 users in 50+ improvement projects.

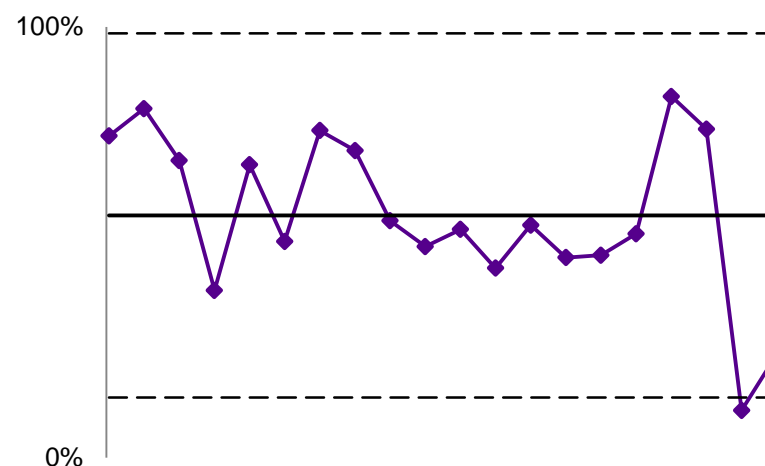
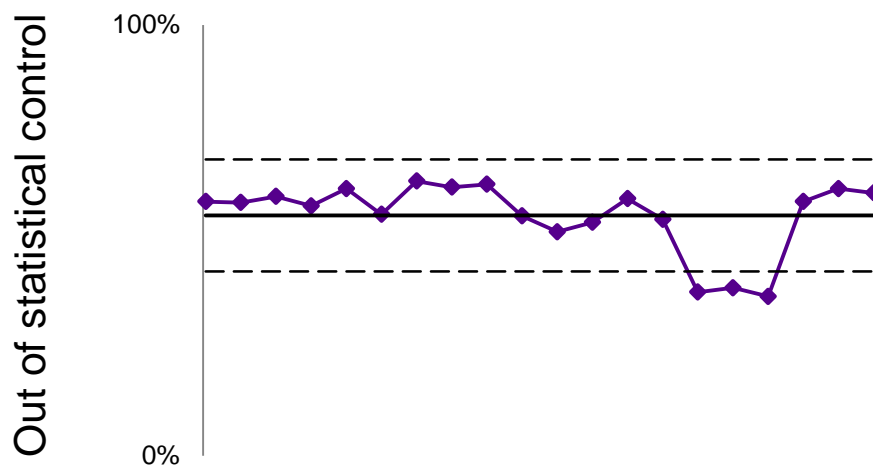
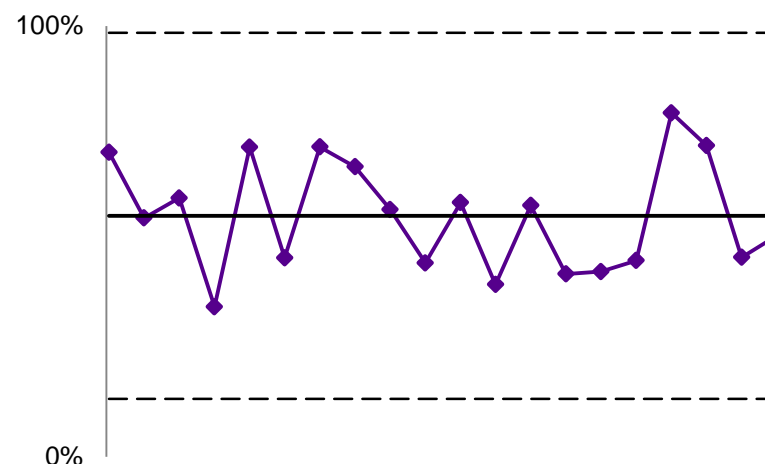


Quantitative measure
and SPC

Narrow control limits



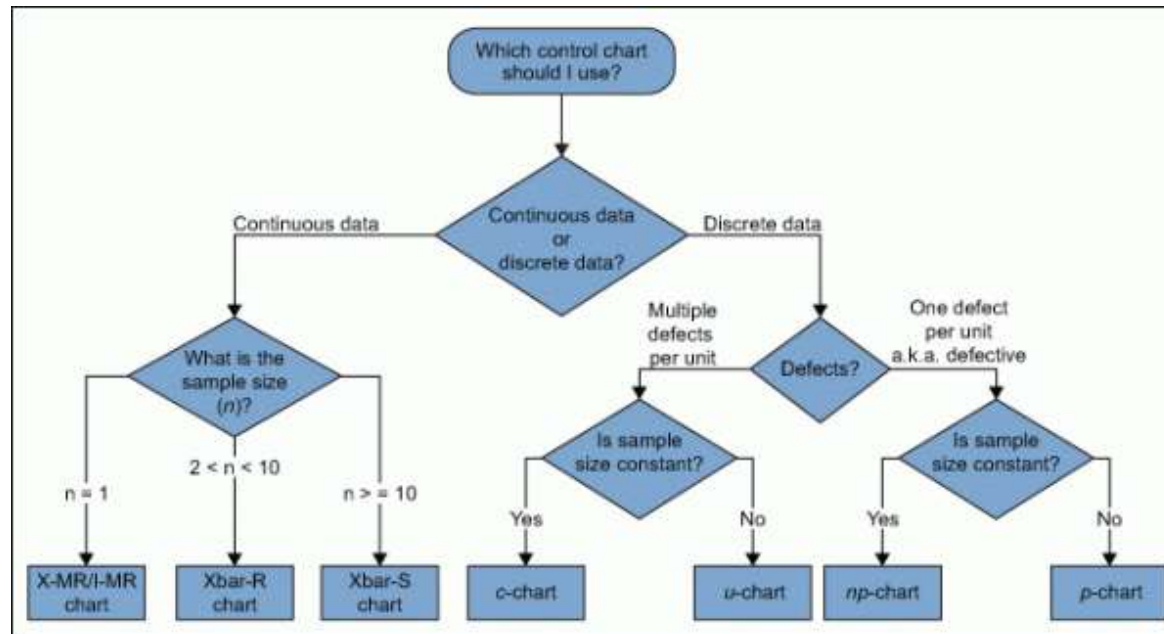
Wide control limits



Which Chart?

- There are several control charts available in SPC
- The specific chart depends on the type of data:
 - Attribute data (pass/fail, not-breach/breach, etc)
 - Continuous data (any number in a range – length of time, BMI, etc)
- Also depends on whether certain assumptions hold
- Percentage data are attribute in nature
- Changes in limit width on attribute charts do not reflect reduced variation in the process, but instead reflect differences in expected variation depending on the subgroup size.

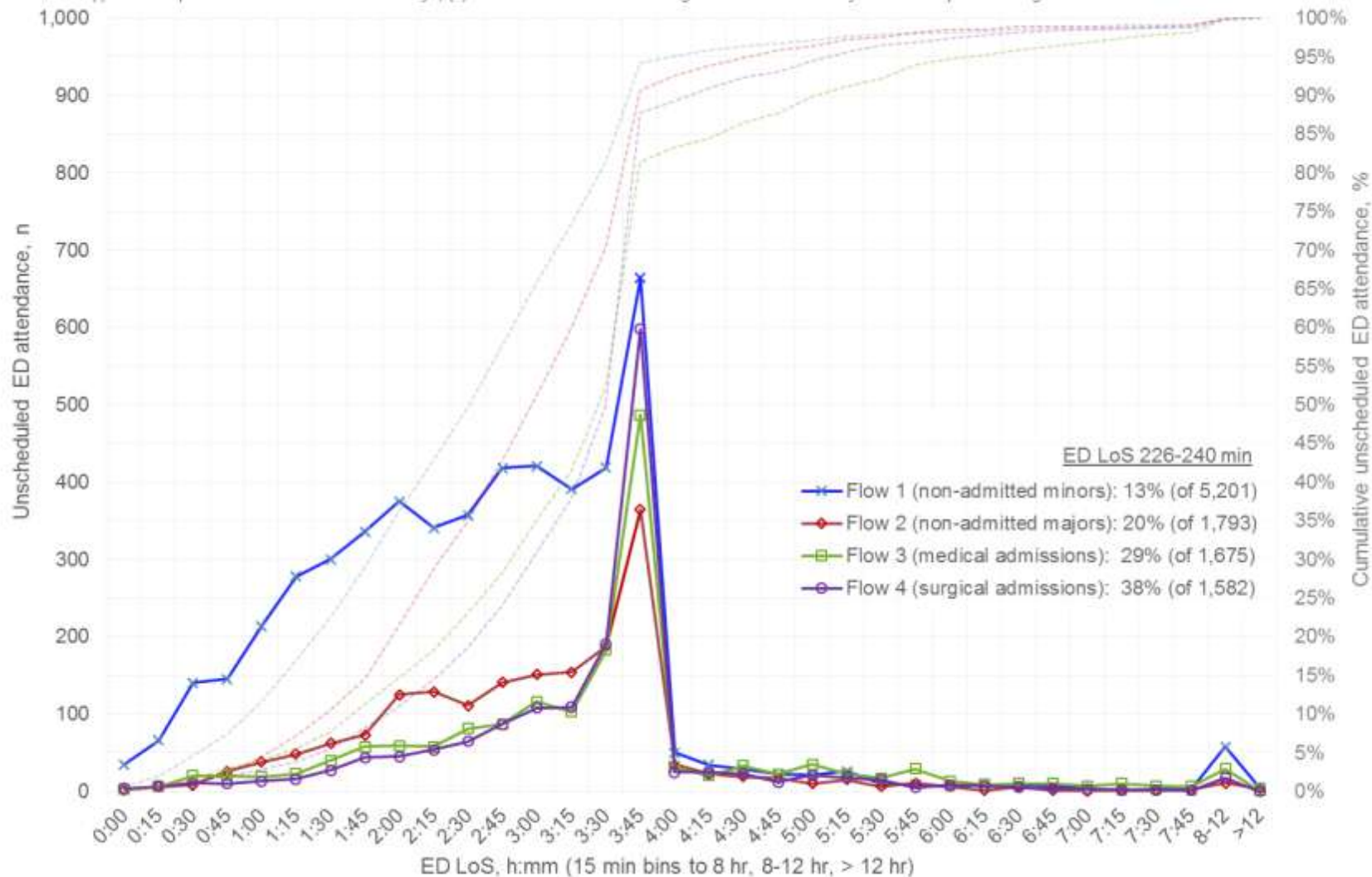
Which chart? *from Wheeler*



ED LoS distribution for unscheduled ED attendances, 2 Sep to 27 Oct 2013

Unscheduled ED attendance, by patient flow group, n; ED LoS in 15 min bins to 8 hr, 8-12 hr, > 12 hr

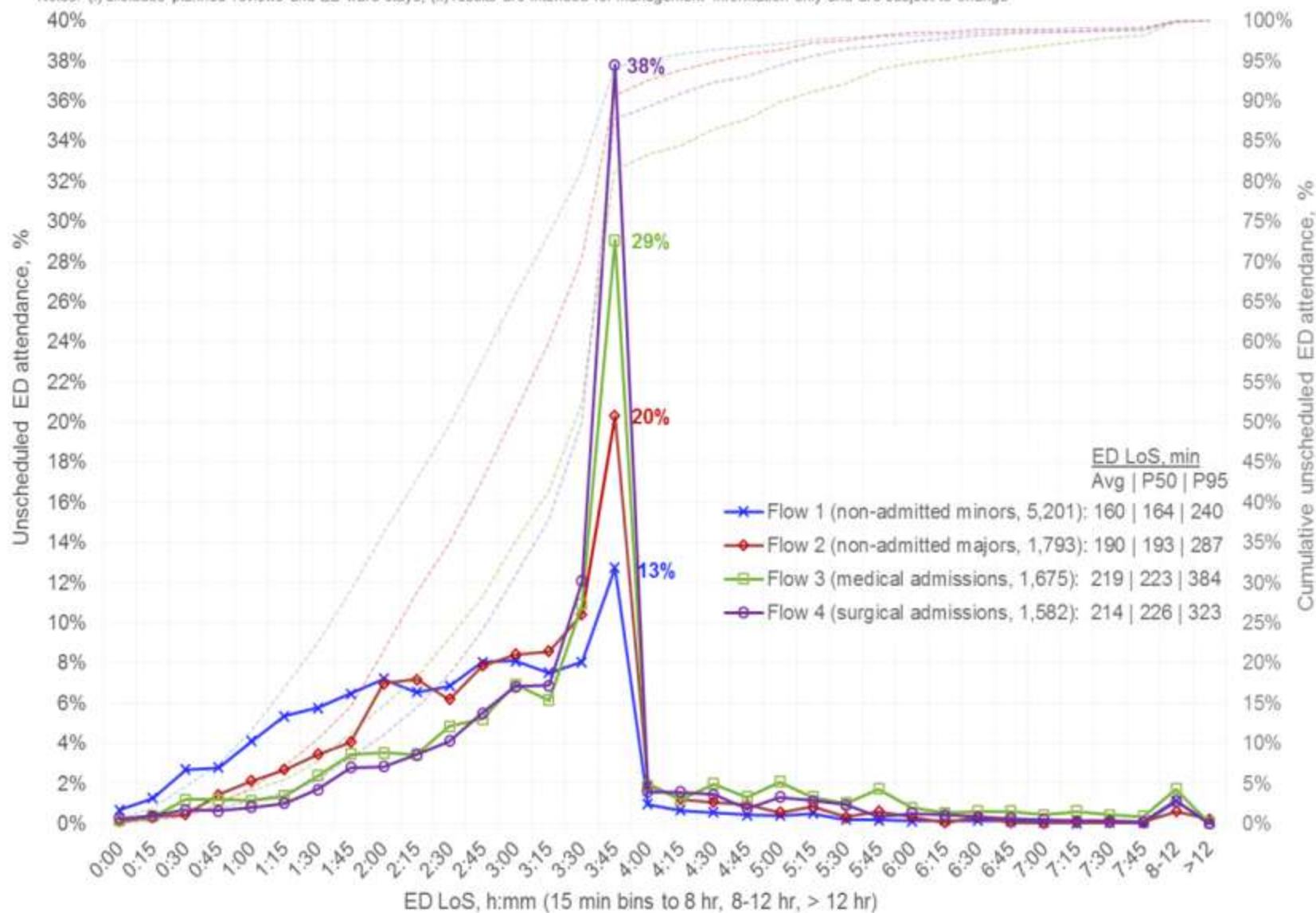
Notes: (i) excludes planned reviews and ED ward stays; (ii) results are intended for management information only and are subject to change



Hospital 2: ED LoS distribution for unscheduled ED attendances, 2 Sep to 27 Oct 2013

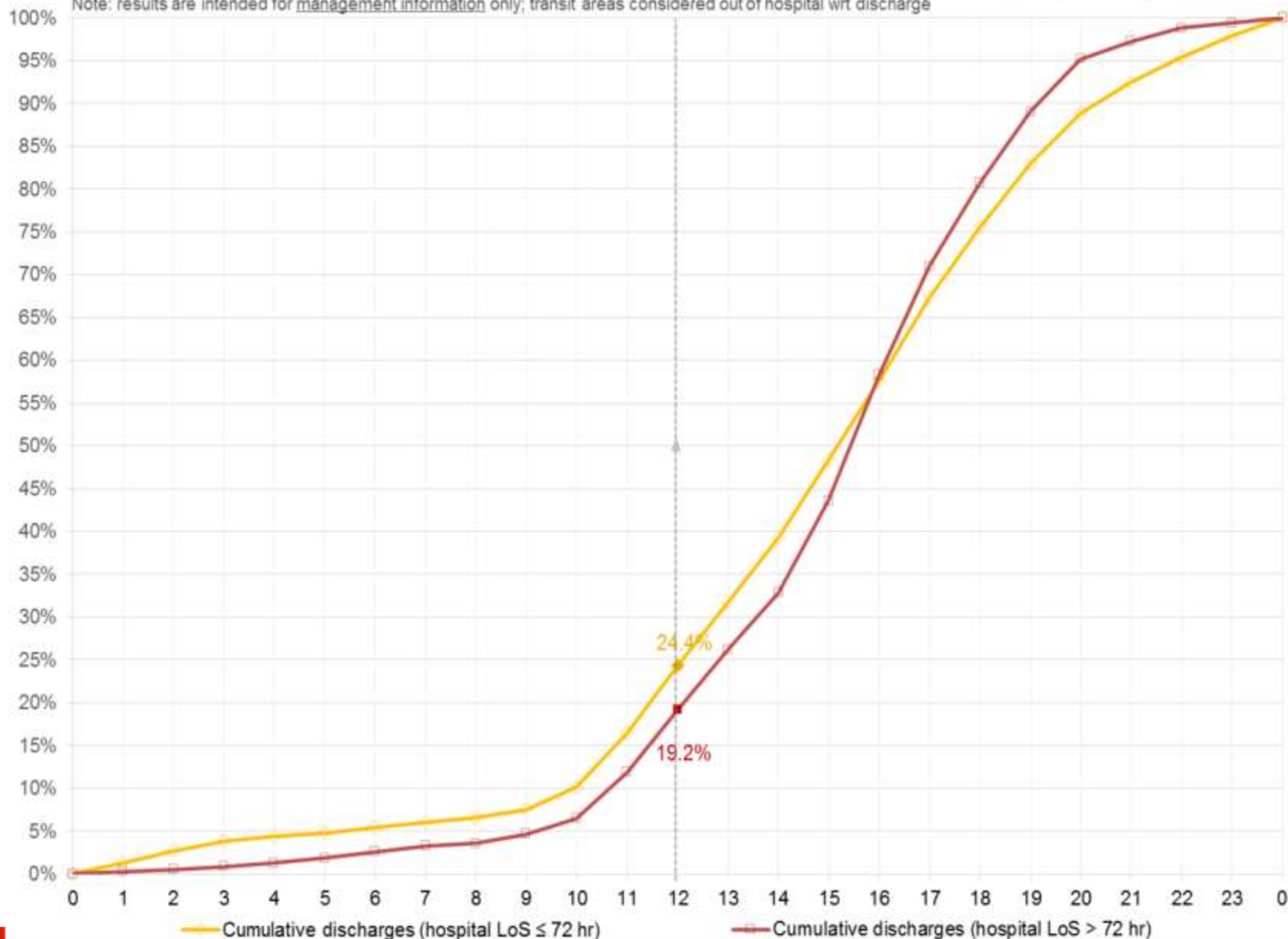
Unscheduled ED attendance, by patient flow group, %; ED LoS in 15 min bins to 8 hr, 8-12 hr, > 12 hr

Notes: (i) excludes planned reviews and ED ward stays; (ii) results are intended for management information only and are subject to change



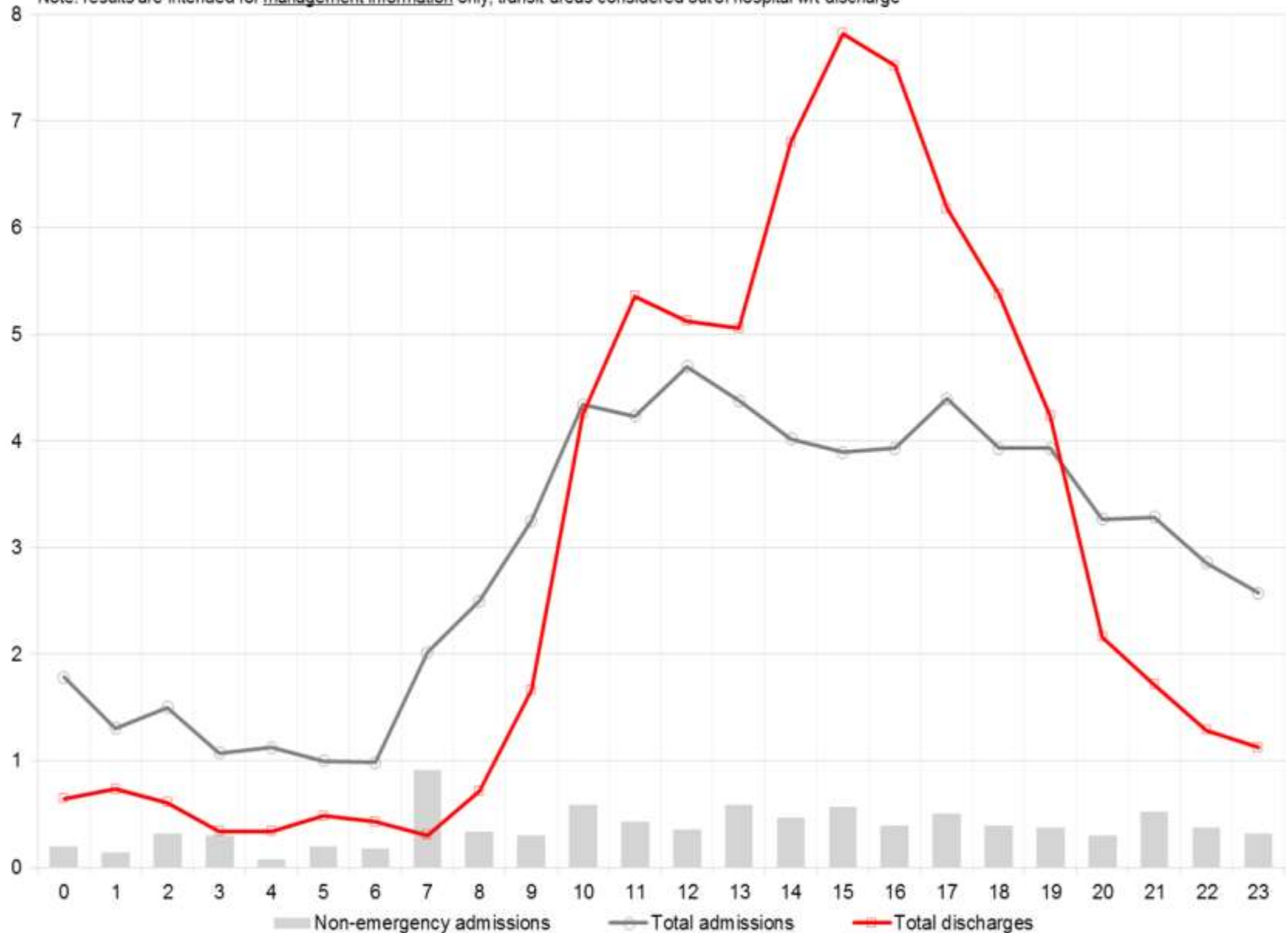
Hospital 2: cumulative hourly hospital inpatient discharge profile, 2 Sep to 27 Oct 2013

Proportion of hospital discharges completed (excl. same-day non-emergency admissions and non-admitted ED attendances), %, by hour of day, n
 Note: results are intended for management information only; transit areas considered out of hospital wrt discharge



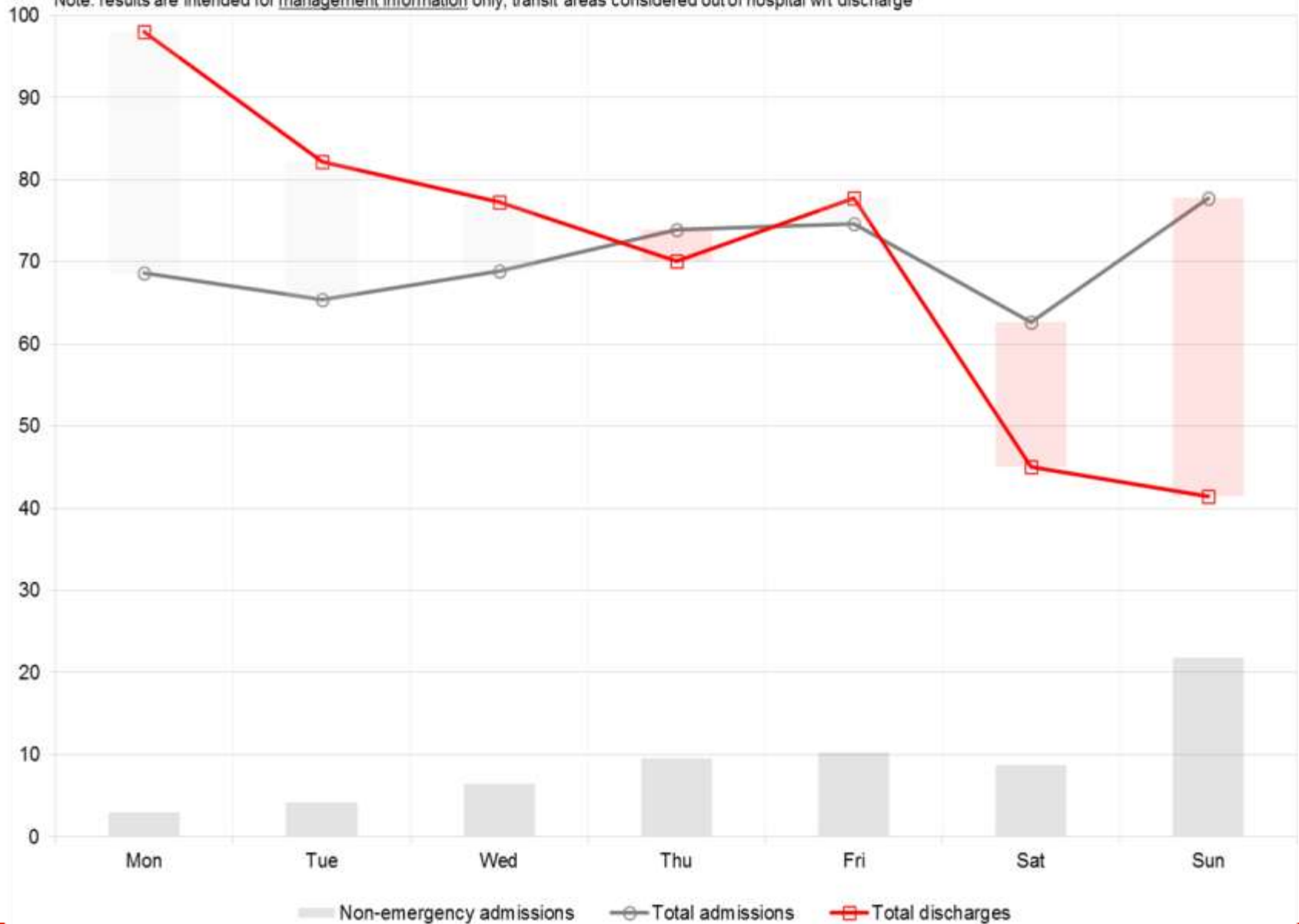
Colla Northwe Hospital 2: hourly hospital inpatient arrival and discharge profile, 2 Sep to 27 Oct 2013

Average hourly hospital arrivals and discharges (excl. same-day non-emergency admissions and non-admitted ED attendances), by hour of day, n
Note: results are intended for management information only; transit areas considered out of hospital wrt discharge



Coll: Hospital 2: daily hospital inpatient arrival and discharge profile, 2 Sep to 27 Oct 2013

Northwe Average daily hospital arrivals and discharges (excl. same-day non-emergency admissions and non-admitted ED attendances), by day of week, n
Note: results are intended for management information only; transit areas considered out of hospital wrt discharge



Colla Hospital 2: AAU spell LoS distribution, 2 Sep to 27 Oct 2013*

Northwe

AAU stays for *all patients discharged from hospital 2 Sep to 27 Oct 2013, n; AAU spell LoS in 2 hr bins to 72 hr, ≥ 72 hr

Notes: (i) AAU spell LoS calculated in minutes and excludes transit areas; (ii) results are intended for management information only and are subject to change

