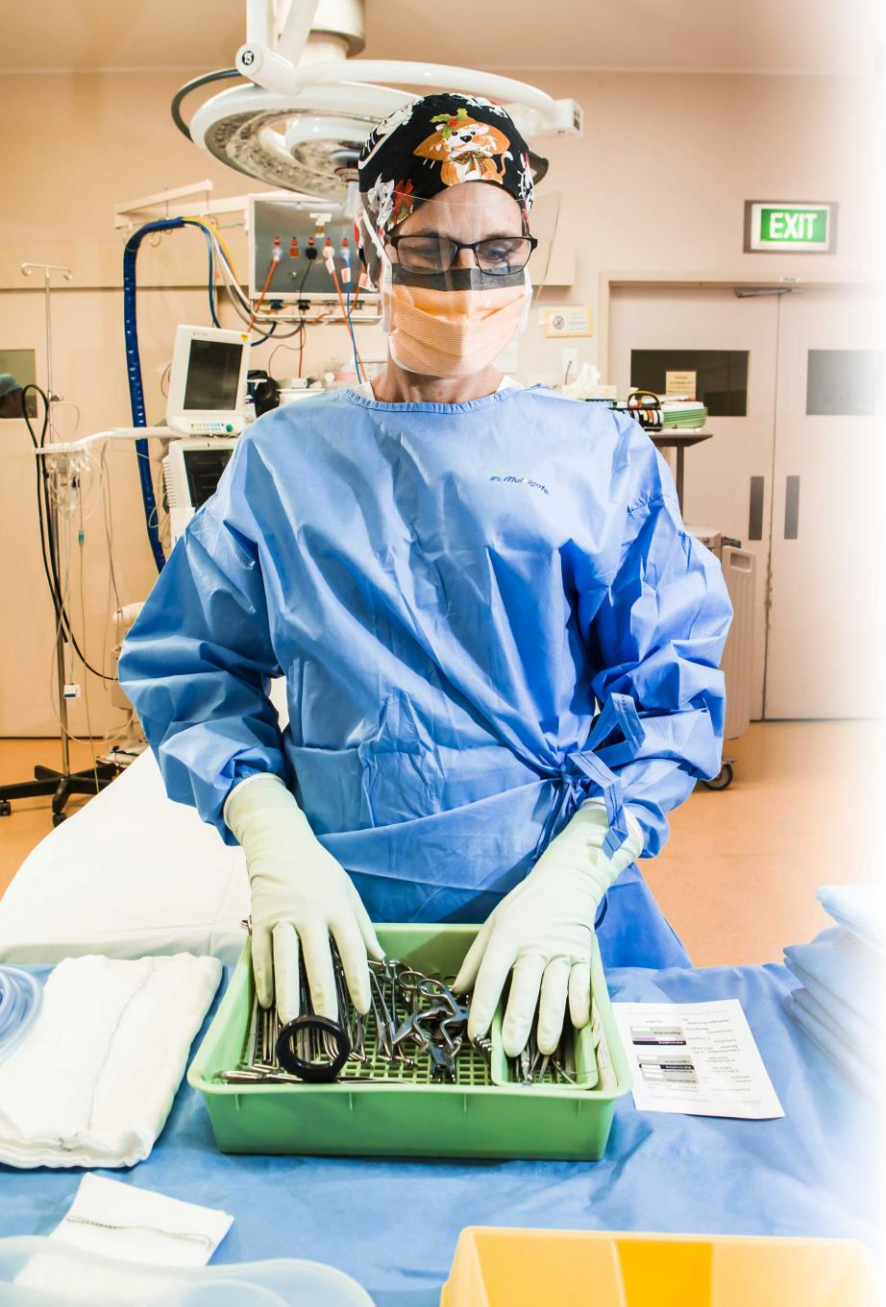


Going Digital

Using data to support care



Michael Draheim
CIO, Metro South Health
Adjunct Professor, UQ Business School



Who are we - Princess Alexandra Hospital

Services	<ul style="list-style-type: none"> • Tertiary Hospital - all adult specialities except obstetrics & gynaecology • Nationally recognised for expertise in trauma management, cardiac care, cancer care • Major transplantation centre for livers, kidneys, bone, cartilage and corneas
Beds	Total beds (and bed alternatives) = 1,057
Budget	2014/15 \$945.6 million 2015/16 \$971.2 million 2016/17 \$1.012 billion
Activity Snapshot 2015/16	104,260 patients admitted to the hospital
	21,560 total surgical admissions
	494,813 outpatient presentations (including telephone telehealth)
	60,679 Emergency Department attendances
Workforce	6,790 (headcount) - 3,110 Nursing - 960 Medical - 986 Health Practitioner/Professional/Tech - 1,035 Admin/Mgr - 699 Operational

What have we Implemented

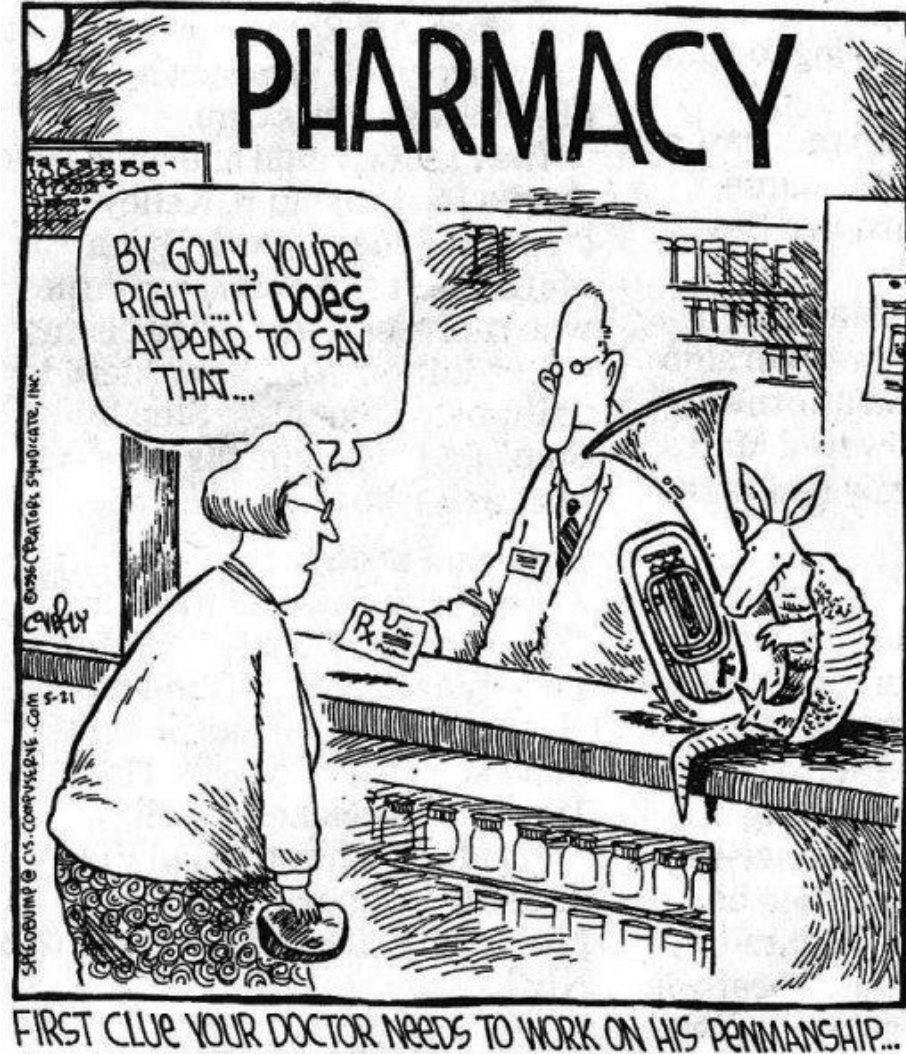


- Structured clinical notes
- Emergency Department
- Surgery, Theatres & Anaesthetics
- Integrated inpatient clinical information
- Pathology and Radiology orders and results
- Scheduling – Outpatients and Elective Surgery
- Device integration & Closed loop observations
- Managing deteriorating patients workflow
- Positive person identification
- CPOE & Medication Management – Closed loop
- Clinical trials
- Reporting, Analytics and Data Warehouse
- 7/24 (downtime)

HIMSS Analytics

STAGE 6

Make the Case - Why Digital



- 10% of patients with a drug allergy are prescribed that drug during a hospital admission
- There are more people in hospital from preventable medication incidents than from asthma and breast cancer combined
- 30% of all radiology and pathology investigations are inappropriate or unnecessary¹
- Most Australian doctors can't order a chest X-Ray electronically.

1. Harvard Medical School, PRESCOTT, 2013

Be Clear why



Why Transform?

- Expectations – clinicians & community
- Changing practice model
- Continuous improvement
- Improve data to manage services
- Service efficiency
- Service complexity
- Paper world can't cope

One Day in Metro South Health



619
people admitted to hospital



748
emergency presentations



3,110
outpatient appointments



73
elective surgery procedures

The Data Landscape in Healthcare

HEALTHCARE'S DIGITAL FUTURE

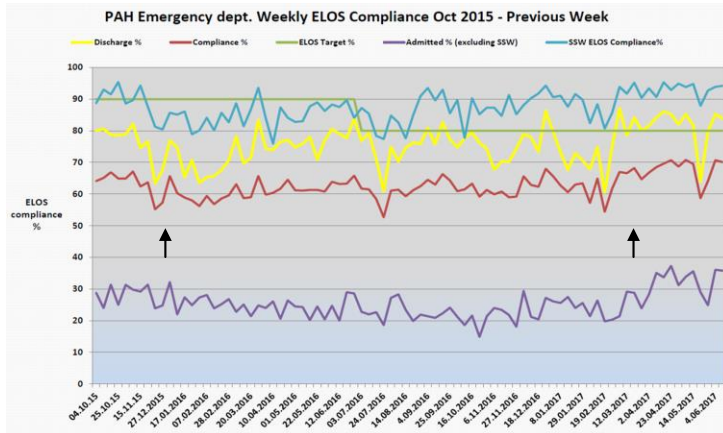
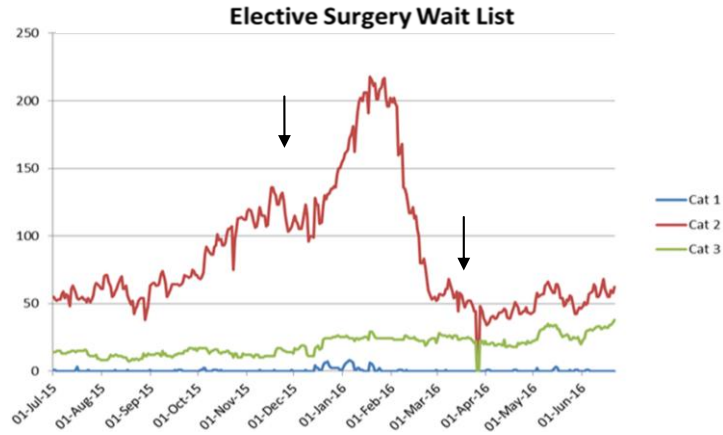


- Traditionally focus on data exercises:
 - Performance based
 - Manually codified
 - Output/Outcome driven
 - Resource intensive
 - Silos of data
- The future
 - Real time
 - Integrated care
 - Data driven
 - Consumer centric

Princess Alexandra Hospital - Year 1 Digital Hospital Experience

Activity

Go Live



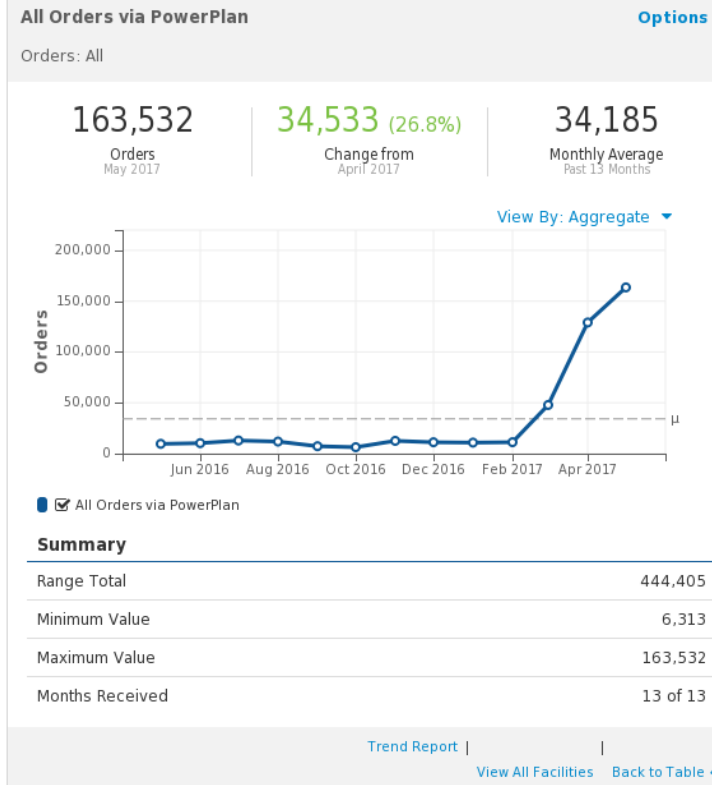
Post Go Live

QWAU	10%	↑	(April 2017 YTD)
Seps	7.2%	↑	(April 2017 YTD)
ALOS	5%	↓	(April 2017 YTD)

Reducing care variation

Variation

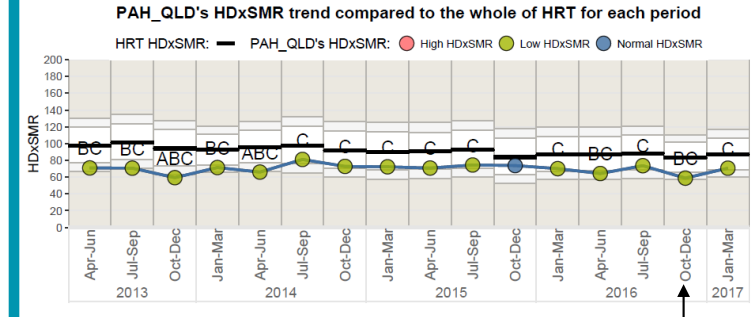
- 80+ Power Plans introduced
- 40+ Order sets activated



Power Plans ordered	12,220	(May 2017)
Unique patients	80,518	(May 2017)
Total measured transactions	57.7M	(May 2017)

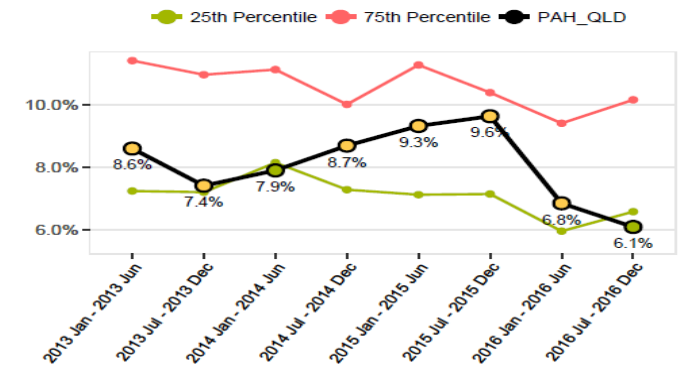
Performance benefits

Hospital standardised mortality



Rapid response	↑	45%
Cardiac arrests (2016 cf 2015)	↓	15 less than predicted
Emerg re-admits	↓	4%
Falls with injury (2016 cf 2015)	↓	12%

Failure to rescue



Formula: [patients identified as failure to rescue] / [total patients]

Source: Casemix

Description: % of episodes with specified complications of care, where the patient died

Digital Hospital Benefits

A benefit is a measurable improvement resulting from a change that is perceived to be an advantage by a stakeholder.

The benefits associated with the digital hospital system at PAH have been achieved because the hospital's clinical and non-clinical staff have embraced innovation in healthcare.



Early identification of deteriorating patients

Rapid Response Team calls

JAN 2015 vs JAN 2017

45%



Hospital standardised mortality rate

In hospital deaths per 100 expected deaths

JUL-DEC 2014 vs JUL-DEC 2016

12%



Pathology results

Formal endorsement of renal lab results

OCT 2015 vs OCT 2016

11%



Radiology results

Formal endorsement of ED Radiology results

JUN-NOV 2015 vs JUN-NOV 2016

95%



Readmissions

Emergency readmissions within 28 days of discharge

JUL-DEC 2014 vs JUL-DEC 2016

4%



Inpatient length of stay

Average for all admissions

JUL-DEC 2014 vs JUL-DEC 2016

6%



Stationery costs

Clinical forms only

MAR-MAY 2014 vs MAR-MAY 2016

73%



Medical Record Department staffing

Reallocation of FTE effort associated with managing medical records to utilisation of resources in other areas

SEP 2014 vs DEC 2016

19%



Stage 3 and 4 pressure injuries

No. of patients with stage 3 and 4 pressure injuries of total patients

JUL-DEC 2014 vs JUL-DEC 2016

53%



Infections

Healthcare associated SAB per 10,000 bed days

JUL-DEC 2014 vs JUL-DEC 2016

28%



Data supporting quality care



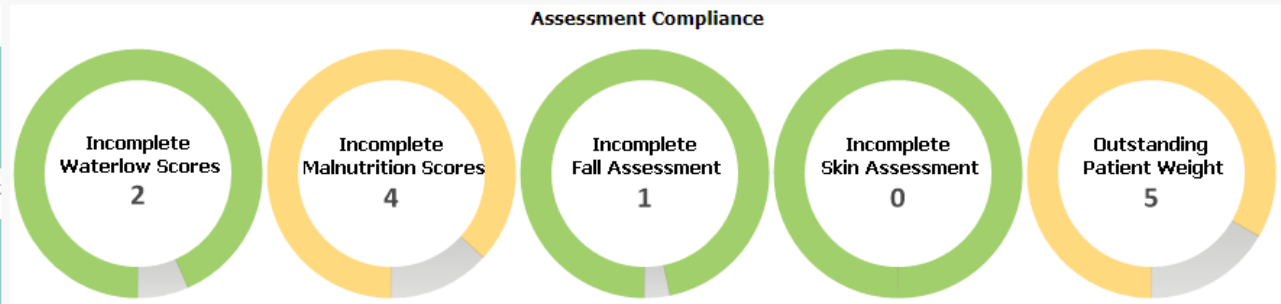
All Divisions Cancer Services Emergency Services **Medicine** Rehabilitation Surgery

All Wards **WMAPU**

All Rooms 48 49 50 51 52 53 55 57 59 61 62 63 64

Clear Selections

Ward Current Inpatients	Ward Admissions within Last 12 Hours	Total Red Alerts Within Last 12 Hours	Total RRTs Within Last 24 Hours	Cannulas insitu > 72 Hours
30	1	1	0	0 (0.0%)
Patients at Risk of Falling	Patients with Waterlow Score >= 10	Patients with Waterlow Score >= 15	Patients with Malnutrition Score > 0	Patients With High Risk Medications
28 (96.6%)	12 (42.9%)	5 (17.9%)	9 (34.6%)	7 (23.3%)



MRN	Patient Name	Admitted (dd hh:mm)	Room	Bed	Waterlow Score	PI Risk	Malnutrition Score	Malnutrition risk	Falls Risk	Skin Assessment	Weight On Admission	Current Weight	Days Since Last Weight	Cognitive Impairment	Red Alerts (12 Hours)	RRT (24 Hours)	High Risk Medications	Cannula's Dwelling Time (In Hours)
00 16:42		48	1	14	Yes	2	Yes	-	Yes	-	-	-	-	No	0	0	No	3
00 14:50		48	2	6	No	0	No	Yes	Yes	86.1	86.1	-0	No	0	0	No	28	
00 16:05		49	1	8	No	0	No	Yes	Yes	58	58	0	No	0	0	Yes	18	
04 18:30		49	2	14	Yes	0	No	Yes	Yes	58.7	58.5	-0	No	1	0	Yes	-	
04 04:24		49	3	6	No	0	No	Yes	Yes	131.3	131	0	No	0	0	No	37	
04 19:32		49	4	14	Yes	1	Yes	Yes	Yes	56	56	4	Yes	0	0	Yes	71	
00 10:58		50	1	24	Yes	2	Yes	Yes	Yes	91.5	91.5	-0	No	0	0	No	15	
01 16:44		50	2	-	-	0	No	Yes	Yes	-	-	-	Yes	0	0	No	47	
01 22:07		51	1	3	No	0	No	Yes	Yes	101.5	101.5	1	No	0	0	No	46	
00 20:20		51	2	15	Yes	1	Yes	Yes	Yes	50.9	54.7	-0	No	0	0	No	25	
00 19:32		51	3	-	-	-	-	Yes	Yes	-	-	-	No	0	0	No	7	
00 12:45		51	4	10	Yes	0	No	Yes	Yes	102	102	0	No	0	0	No	15	
00 19:18		52	1	13	Yes	2	Yes	Yes	Yes	111.7	111.9	-0	No	0	0	Yes	38	
04 09:07		52	2	19	Yes	2	Yes	Yes	Yes	43.9	43.9	3	No	0	0	Yes	-	
01 17:55		53	1	7	No	0	No	Yes	Yes	77.7	77.7	1	No	0	0	No	47	
00 20:04		53	2	20	Yes	2	Yes	Yes	Yes	-	-	-	Yes	0	0	No	-	
01 19:10		53	3	7	No	0	No	Yes	Yes	101	99.9	-0	No	0	0	No	42	
03 18:24		53	4	7	No	0	No	No	Yes	98	92.2	1	No	0	0	No	-	
02 11:57		55	1	12	Yes	3	Yes	Yes	Yes	54.7	55.4	1	No	0	0	Yes	42	
02 19:26		55	2	5	No	-	-	Yes	Yes	-	-	-	No	0	0	Yes	-	
00 16:57		57	1	11	Yes	0	No	Yes	Yes	76.8	76.8	0	No	0	0	No	23	
01 15:25		57	2	4	No	0	No	Yes	Yes	100.6	100.6	1	No	0	0	No	-	
03 20:21		59	1	7	No	0	No	Yes	Yes	90.6	90.6	3	No	0	0	No	-	
00 21:59		59	2	7	No	0	No	Yes	Yes	83.4	83.8	-0	No	0	0	No	28	
00 15:25		59	3	3	No	0	No	Yes	Yes	74	74	0	No	0	0	No	16	
02 11:15		59	4	7	No	0	No	Yes	Yes	92.9	92.9	1	No	0	0	No	61	
00 12:45		61	1	8	No	-	-	Yes	Yes	83.2	83.2	0	No	0	0	No	-	
01 15:06		61	2	6	No	0	No	Yes	Yes	93	93	1	No	0	0	No	-	
Count	30				12		9	29		25	25	25	3	1	0			



Start Date End Date

Year

Month

Division

- Rehabilitation
- Medicine
- Surgery
- Mental Health
- Cancer Services

Ward

- | | | | |
|------|-------|----------|-------|
| BANK | W2C | W4D | WCCU |
| BIRU | W2CHD | W4E | WICU |
| BUNY | W2D | W5A | WMAPU |
| CASS | W2DHD | W5B | WSCES |
| GREV | W2E | W5C | |
| SIU | W3C | W5D | |
| W1C | W4A | WAAPE | |
| W1D | W4BR | WAAAP... | |
| W2A | W4BT | WAAAPW | |
| W2B | W4C | WCARD | |

MRN Search

Injury

- Mucosal membrane
- Stage 1
- Stage 2
- Stage 3
- Stage 4
- Suspected deep tissue injury
- Unstageable

Show Current Inpatients Only

Show All Encounters

Total Skin Assessments
487,036

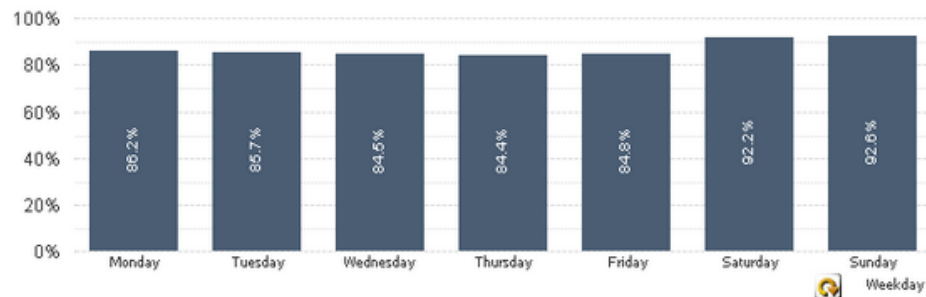
Patients with Skin Assessments
38,722

Skin Assessments Completed On Time
55,375 (86.4%)

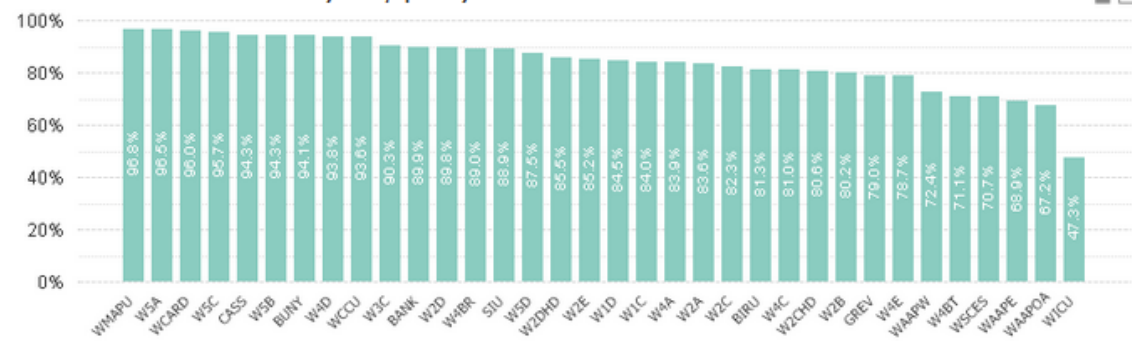
Avg Skin Assessments per Patient
12.6

Total Inpatient Encounters in Overnight Wards
64,114

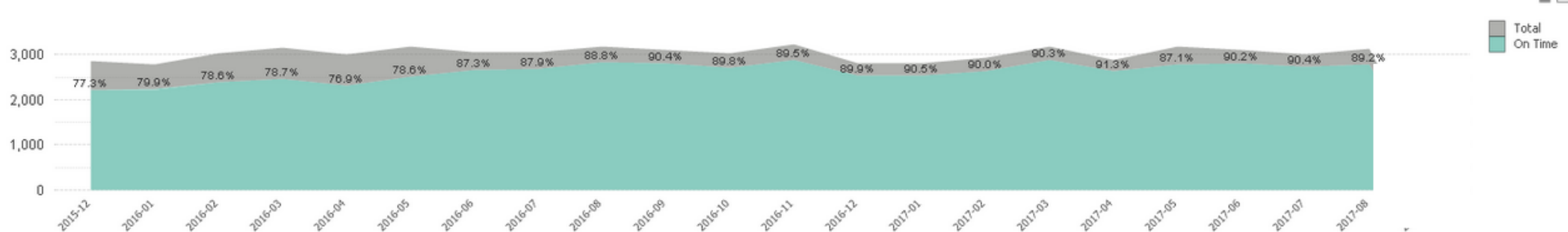
Skin Assessments Performed on Time by Day/Month/Year



Skin Assessments Performed on Time by Ward/Specialty



Skin Assessments Performed Total vs On Time



Pressure Injury Present



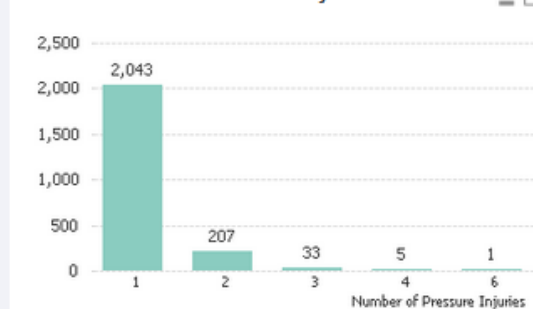
Wound Present



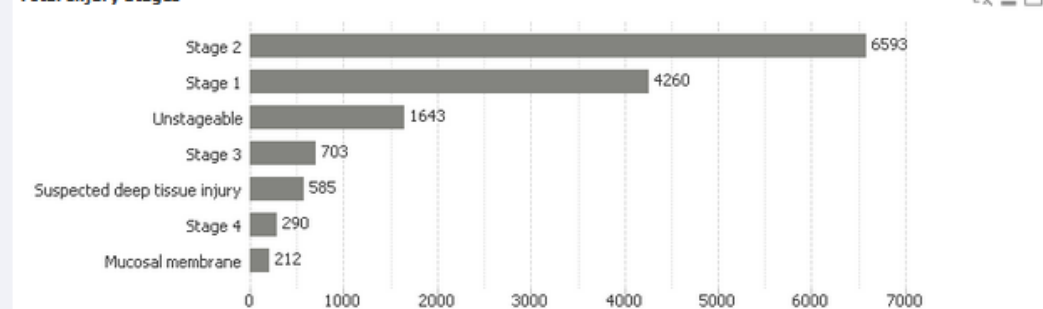
Skin Tear Present



Number of Patients with Pressure Injuries



Total Injury Stages



MSH Digital Governance Model

Metro South Digital Executive Committee

Strategic

Digital Clinical Improvement
Prioritisation Group (DCIP)

Digital Hospital Benefits
Committee

Digital Technical Committee

Digital Data Governance Group

Tactical

MSH Medical Digital Workflow
Committee

MSH Nursing Digital Workflow
Committee

PAH Digital Hospital Committee

Logan & BDH Digital Hospital
Committee

MSH Allied Health Digital Workflow
Committee

MSH Admin Digital Workflow
Committee

QEII Digital Hospital Committee

Redland & Wynnum Digital Hospital
Committee

Operational

Digital Support and
Adoption Services

Adoption/
Support

Training

BCP

System
Enhancement

Success Story – Clinical Deterioration

- Worked with multi-disciplinary Clinical & IT team to identify core attributes in visualising current and trended data associated to deterioration of patients within the confine of their hospital stay.
- Integrated multiple datasets from silo systems into MSH Warehouse
 - ieMR, HBCIS (PAS), Rapid Response Team Local Database
- Data visualised via Interactive Dashboards – giving ability for clinical staff to review:
 - When and where deterioration is occurring within the hospital
 - Patient's 'at Risk' of deteriorating to point of requiring Rapid Response
 - Clinical Outcomes attached to patients who have deteriorated

Clinical Deterioration Dashboard



Start Date: 02/01/2004
End Date: 31/05/2017

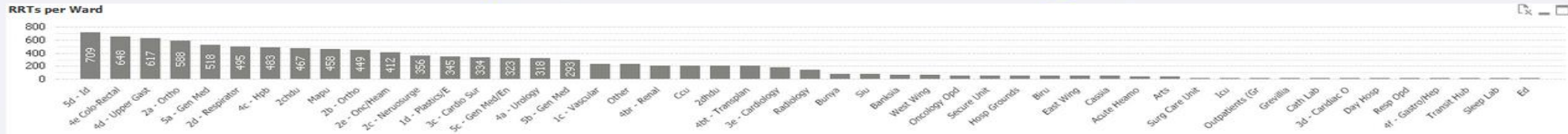
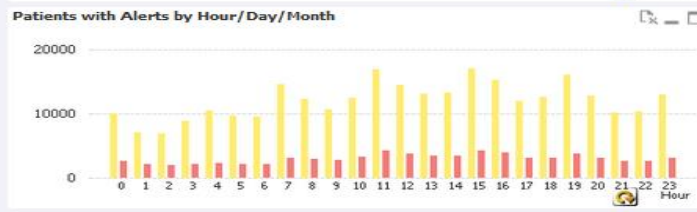
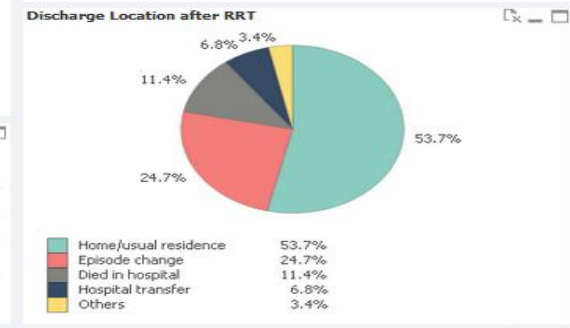
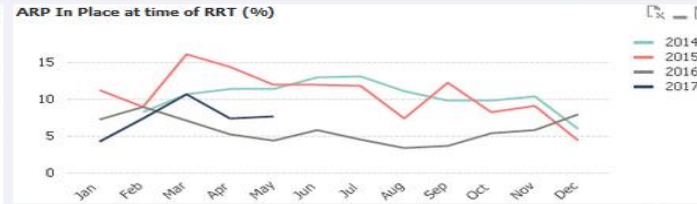
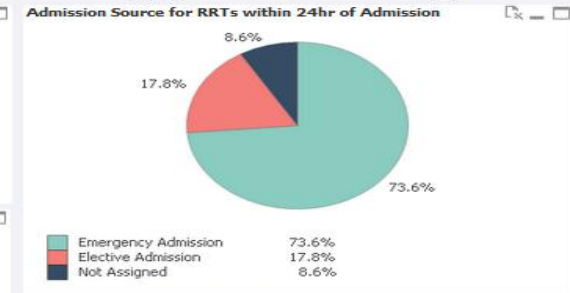
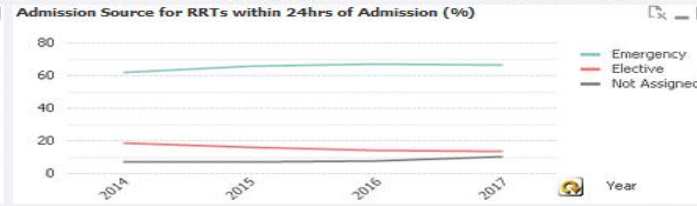
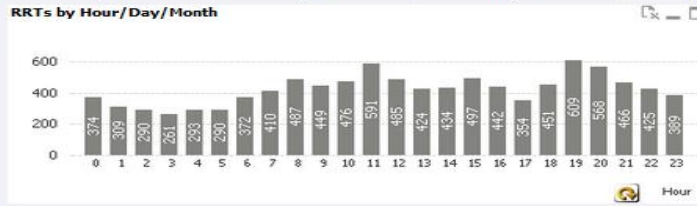
Total RRTs: 10,146
Total Cardiac Arrests: 1,346
Total Red Alerts: 160,723
Total Yellow Alerts: 846,581
Altered Criteria at Time of RRT: 740 (7.3%)
Avg. Time Admission to 1st RRT: 6hr 16min 55sec
Pts with More Than One RRT: 3,212
Patients with RRTs: 5,859

- RRT Ward**
- 1c - Vascular
 - 1d - Plastics/Ent
 - 2a - Ortho
 - 2b - Ortho
 - 2c - Neurosurgery
 - 2chdu
 - 2d - Respiratory
 - 2dhdu
 - 2e - Onc/Heam
 - 3c - Cardio Surg
 - 3d - Cardiac Opd

- Alert Unit**
- 01 1 ED
 - 01 1 W
 - 01 1 W1C
 - 01 1 W1D
 - 01 1 WD
 - 01 1 WDT
 - 01 1 WEDMS
 - 01 1 WEDSS
 - 01 1 WENTD
 - 01 1 WINFUS
 - 01 1 WMU

- Cardiac Arrest Unit**
- 2A
 - ARTHDX
 - BANK
 - BIRU
 - BUNY
 - CAPD
 - CASS
 - Foyer
 - GREV
 - GREVDC
 - HDD
 - HTHU

- Admission Source**
- Elective Admission
 - Not Assigned
 - Emergency Admission



Red & Yellow Alerts

Metro South Health

Princess Alexandra Hospital: Red & Yellow Alerts

Ward View

Executive View

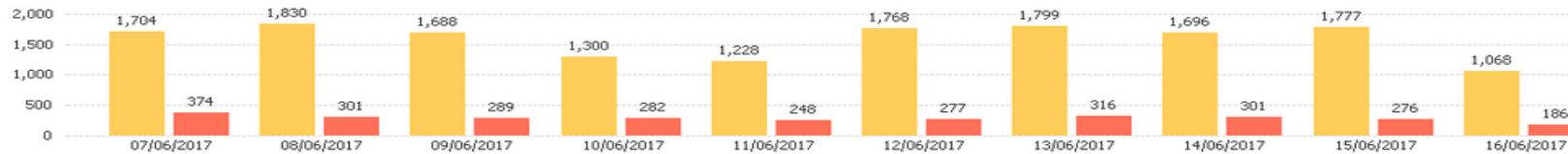
Raw Data

About



Start Date: 01/12/2015
End Date: 16/06/2017

Last 10 Days



Total Yellow Alerts	Patients with Yellow Alerts
869,336	44,793
Total Red Alerts	Patients with Red Alerts
164,765	19,948

Most Common Day & Hour for Any Alert
Wed from 15:00 - 16:00

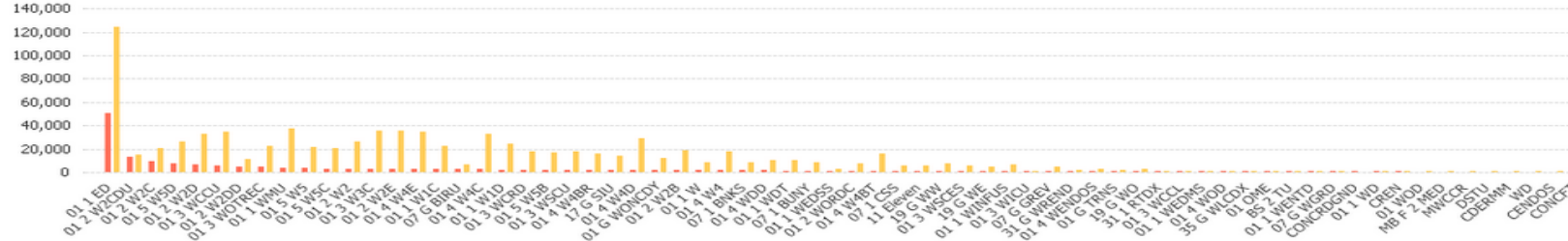
- Unit
- 01 1 ED
 - 01 1 W
 - 01 1 W1C
 - 01 1 W1D
 - 01 1 WD
 - 01 1 WDT
 - 01 1 WEDMS
 - 01 1 WEDSS
 - 01 1 WENTD
 - 01 1 WINFUS
 - 01 1 WMU
 - 01 2 W2
 - 01 2 W2B

Admitting Doctor

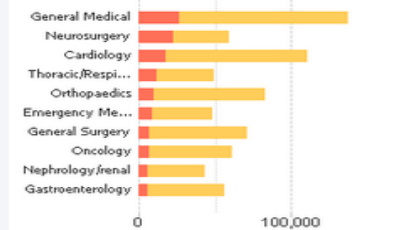
Admitting Speciality

- Addiction Medicine
- Breast Surgery
- Cardiology
- Cardiothoracic Surgery
- Coronary Care Unit
- Craniofacial
- Dental medicine and surgery
- Dermatology
- Diabetes
- Drug and Alcohol
- Emergency Medicine
- Endocrinology
- Endoscopy
- Gastroenterology
- General Counselling
- General Medical

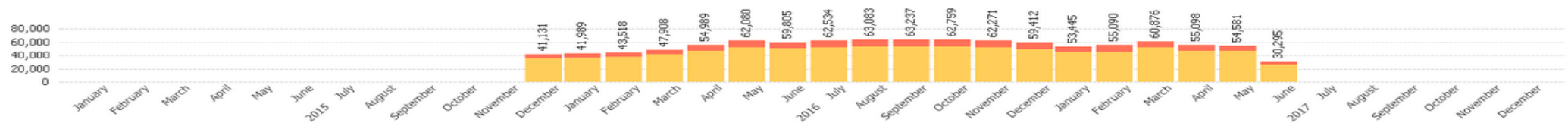
All Alerts by Unit



Top 10 Red Alerts by Speciality



All Data



Current Selections:

Alert Date: >=01/12/2015<=16/06/2017

Alert Data

Alert Date	Unit	Admitting Clinician	MRN	Encounter	Date/Time	Alert Value	Alert Vital
16/06/2017 15:43:00	01 2 W2CDU				16/06/2017 15:43:00	9	GCS
16/06/2017 15:42:00	01 2 W2DD				16/06/2017 15:42:00	90	O2SAT
16/06/2017 15:35:00	01 2 W2C				16/06/2017 15:35:00	13	GCS
16/06/2017 15:32:00	07 1 BNKS				16/06/2017 15:32:00	86	O2SAT
16/06/2017 15:31:00	01 1 W1C				16/06/2017 15:31:00	153	PULSE
16/06/2017 15:22:00	01 3 WOTREC				16/06/2017 15:22:00	85	BP
16/06/2017 15:17:00	01 1 ED				16/06/2017 15:17:00	90	O2SAT
16/06/2017 15:17:00	01 1 ED				16/06/2017 15:17:00	32	RESPRATE

Success Story – Medications Clinical Monitoring

- Worked with key senior clinical staff to develop visualisation of key medication ordering/administration data to allow safety and quality monitoring – especially for ‘risky’ medications/workflows (i.e. Insulin & Heparin)
- Results
 - Live clinical safety & quality monitoring of medication orders & administration
 - Ability to instantly identify ‘risky’ patients (i.e. BGL >16, High/Low APTT etc.)
 - Ability to intervene before administration of medications where unwarranted care deviation
 - Identification of consistent data trends to help assist in optimising functional design of electronic prescribing within ieMR

Digital Diabetes Dashboard

Metro South Health

3D - Digital Diabetes Dashboard

Insulin

Data



Start Date End Date

Scheduled Ordered All

- Ward**
- PAH 01 1 ED
 - PAH 01 1 W1C
 - PAH 01 1 W1D
 - PAH 01 1 WAA
 - PAH 01 1 WDPT
 - PAH 01 1 WEDMHS
 - PAH 01 1 WEDSS
 - PAH 01 1 WENTDP
 - PAH 01 1 WEYEDP
 - PAH 01 1 WINFUS
 - PAH 01 1 WMAPU
 - PAH 01 1 WPDP
 - PAH 01 2 W2A

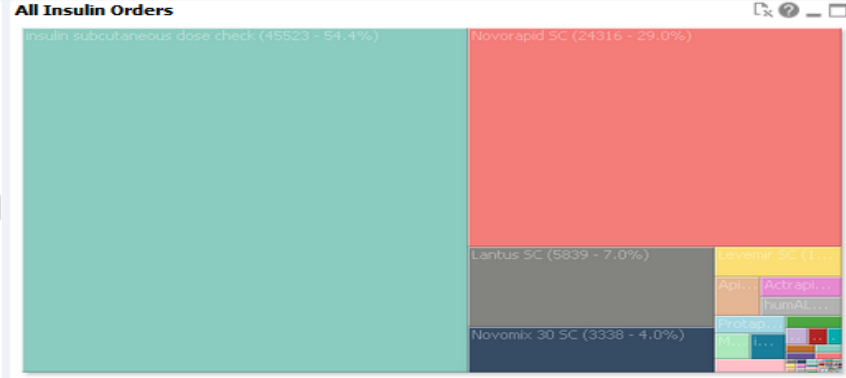
Risk
High

Complexity
Complex

- Ordered As**
- "Ear Drops"
 - "Kiwi" supplement
 - "Magnesium ultra potent powder"
 - "Mood Manager"
 - "Natural Remedy"
 - "Petrol Ester" Natural supplement
 - "Sleep Well"
 - "Strong pain relief"
 - "Super magnesium (+ Vit B6, C, D3)"
 - "Youqevitiv"

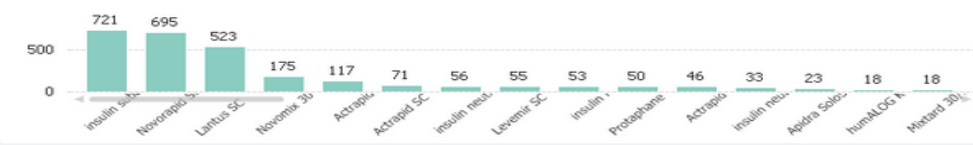
- Select Patients With:**
- BGL > 16
 - BGL < 4
 - All BGL Results
 - Glucose IV Administration
 - Glucagon Administration
 - Own Pump PowerPlan
 - Dka PowerPlan
 - Clear Filters

All Insulin Orders	Patients	Ordered	Completed	Discontinued	Cancelled	Deleted	Pending	Voided	Total	%
Total	1,052	8,518	52,321	3,006	18,539	1,327	0	0	83,7...	100.0...
Actrapid 100 unit/mL injectable solution	4	4	0	0	0	0	0	0	4	0.0%
Actrapid additive + glucose 50% intraveno...	11	0	11	3	0	1	0	0	15	0.0%
Actrapid additive + glucose 50% intraveno...	3	0	3	0	0	0	0	0	3	0.0%
Actrapid additive + glucose 50% intraveno...	1	0	2	0	0	0	0	0	2	0.0%
Actrapid additive + glucose 50% intraveno...	46	0	47	8	0	2	0	0	57	0.1%
Actrapid additive 10 unit(s) + sodium chlori...	3	0	0	3	0	1	0	0	4	0.0%
Actrapid additive 10 unit(s) + sodium chlori...	1	0	0	1	0	0	0	0	1	0.0%
Actrapid additive 12 unit(s) + sodium chlori...	1	0	0	1	0	0	0	0	1	0.0%
Actrapid additive 50 unit(s) + sodium chlori...	117	4	1	186	3	1	0	0	195	0.2%
Actrapid additive 50 unit(s) + sodium chlori...	1	0	0	1	0	0	0	0	1	0.0%
Actrapid additive 1000 unit(s) + sodium chl...	1	1	0	0	0	0	0	0	1	0.0%
Actrapid SC	71	65	228	11	160	9	0	0	473	0.0%
Apidra 100 unit/mL subcutaneous solution	7	6	1	2	0	0	0	0	9	0.0%
Apidra SoloStar	23	9	387	22	105	0	0	0	523	0.6%
Apidra SoloStar 100 unit/mL subcutaneous ...	11	11	0	2	0	1	0	0	14	0.0%
humALOG 100 unit/mL subcutaneous soluti...	6	4	0	0	0	0	0	0	6	0.0%
humALOG KwikPen	18	11	295	25	128	0	0	0	459	0.5%
humALOG KwikPen 100 unit/mL subcutane...	9	8	0	1	0	1	0	0	10	0.0%
humALOG Mix25 KwikPen	9	9	46	4	35	0	0	0	94	0.1%
humALOG Mix25 KwikPen subcutaneous s...	5	5	0	0	0	0	0	0	5	0.0%
humALOG Mix25 subcutaneous suspension	3	3	0	0	0	0	0	0	3	0.0%
humALOG Mix50 KwikPen	5	3	38	3	22	0	0	0	66	0.1%
humALOG Mix50 KwikPen subcutaneous s...	3	2	0	1	0	0	0	0	3	0.0%

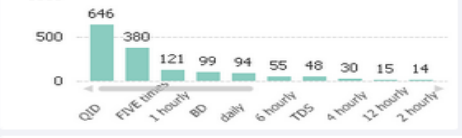


- Patients with Insulin Administered**: 936
- Patients with IV Insulin Administered**: 72
- Patients with Glucagon Administered**: 38
- Patients with 50% Glucose Administered**: 169
- Patients with Initiated Diabetic Ketoacidosis PP**: 0
- Patients with Initiated Patients Own Pump PP**: 7
- Patients with insulin subcutaneous dose check**: 721
- Patients with subcutaneous insulin order**: 721

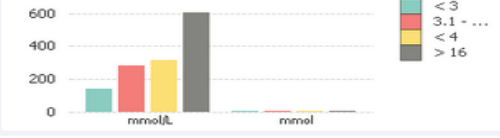
Number of Patients on Insulin Orders by Insulin Type



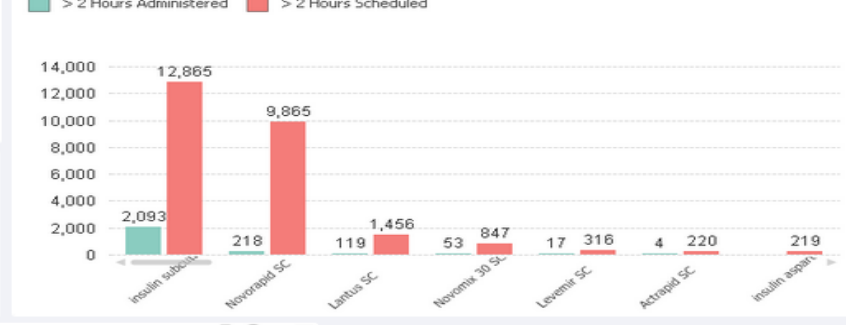
Patients with Blood Glucose Monitor...



Patients on Insulin with BGL Results per R...



Insulin Orders Not Given Within 2hrs of Scheduled Time



MRN	Ward	Ordered As	Scheduled Date/Time	Administered Date/Time	Ordered Dose	Ordered Un...	Order Co...
		insulin subcutaneous dose check	4/05/2017 10:00:00 PM	-	-	-	3
			4/05/2017 6:00:00 PM	-	-	-	3
			5/05/2017 12:00:00 PM	-	-	-	3
			4/05/2017 6:00:00 AM	-	-	-	1
			4/05/2017 12:00:00 PM	-	-	-	3
			3/05/2017 10:45:00 PM	-	-	-	1

Success Story – Pathology & Radiology

Endorsement

- Interactive dashboards providing near real time visibility Results being ordered, and consequently endorsed within the ieMR Results
 - Ability to filter by location, clinician designation, encounter type, Pathology Catalogue type, date etc.
 - Views of the data can be changed to display by Unit, Treating Clinician or Ordering User
 - Clinicians & Executives are able to query the dashboard down to staff/patient level, and if desired, expose result specific data attached to each event
- Results
 - Transparency across organisation as to compliance with viewing/endorsing results
 - Ability for Clinical Leadership to follow-up with services/staff who require more attention/support

Key Messages

- No matter which tool you use, the output will only be as good as the data that is entered into the source system
 - Implementation of a digital system causes disruption to the organisation
 - focus and support needs to be provided to clinicians to ensure quality of data inputted into the system supports immediate patient care, but also analytic exercises
- Start small and grow organically
- Multidisciplinary approach to Health Analytics is critical
 - IT staff who can understand and operate in clinical environment,
 - Clinical staff who can understand and operate in IT environment

Thank you!

