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@AIHI_MQ

Stepped-wedge Cluster RCT to Assess the Effects of an Electronic Medication System on Medication Administration Errors

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Join us in achieving...

Medication Without Harm



WHO Goal:
Reduce severe, avoidable harm related to
medications by >50% over 5 years globally

- Global costs associated with medication errors, US\$41B p.a.
- Single most preventable cause of patient harm
- Information technology shows promise
- Few studies of impact of EMS on MAEs in adults or kids



What happens when paper medication charts become electronic in paediatrics?

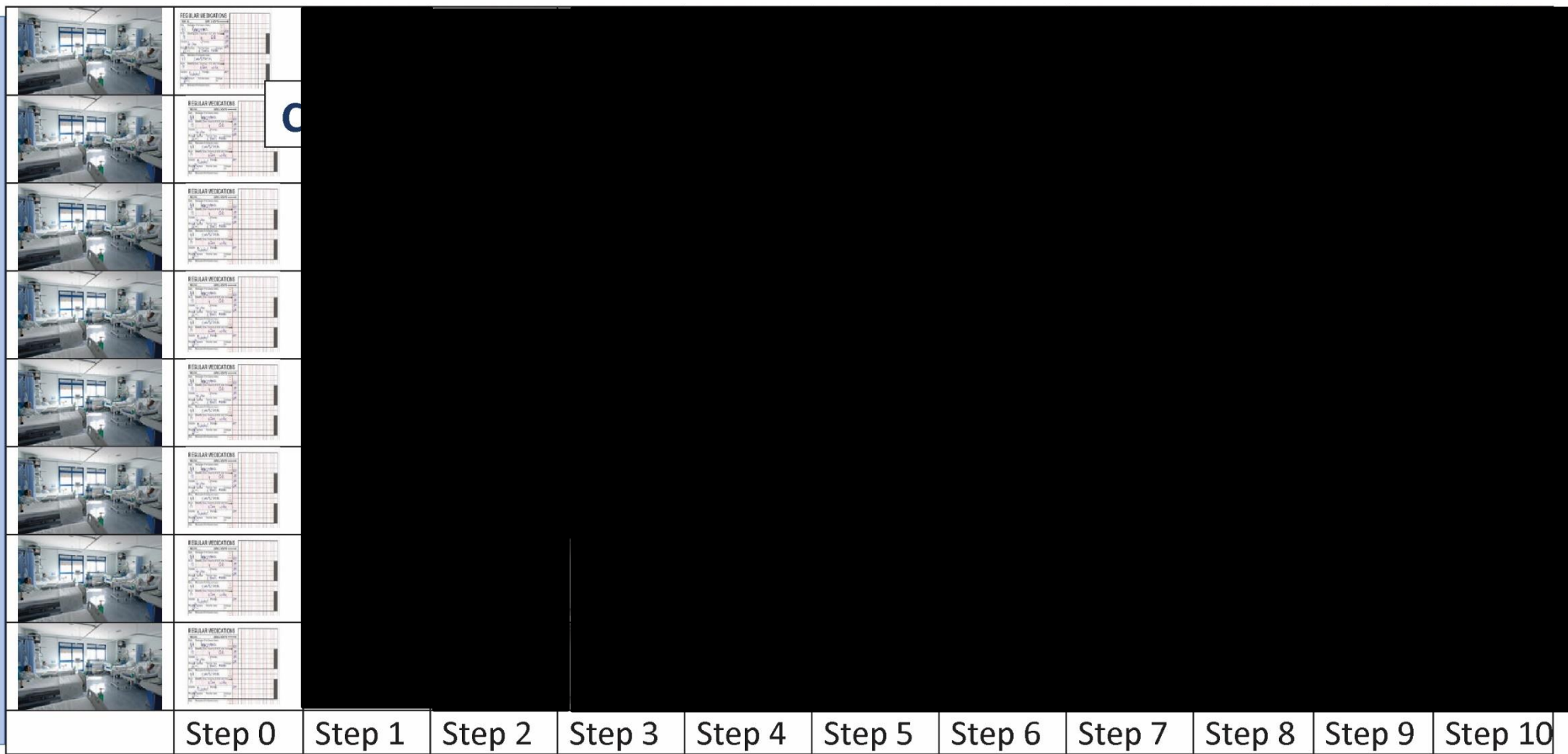


Stepped-wedge Cluster RCT to Assess the Effects of an Electronic Medication System on Medication Administration Errors

Stepped-Wedge Cluster RCT



Wards Randomised



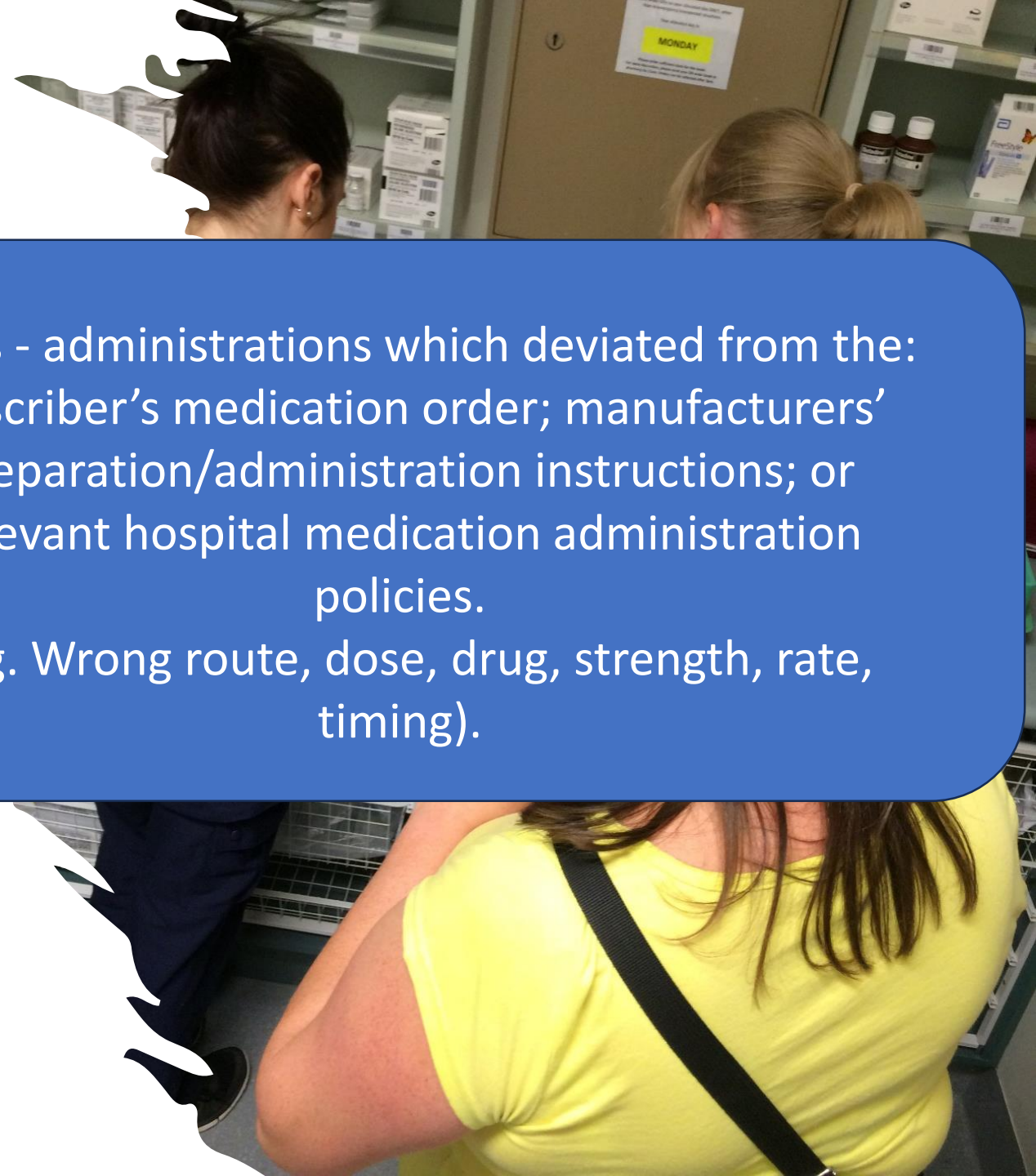
Measured over first 70 days of EMS use

Measure Errors: Prescribing errors, medication administration

Direct Observational Study of Nurses

- 284 nurses across study wards
- Observed 4555 dose administrations to patients
- 07:00-22:00 over 22 weeks on weekdays
- Recorded medications administered
- Inter-rater reliability testing
- Compared with charts to identify errors
- Errors rated for potential severity on 5 point scale; \geq serious error
- Clinical panel assessed MAEs resulting in actual harm

MAEs - administrations which deviated from the: prescriber's medication order; manufacturers' preparation/administration instructions; or relevant hospital medication administration policies.
(e.g. Wrong route, dose, drug, strength, rate, timing).



Analysis

Association between EMS and MAEs



Change in:

- ❖ Occurrence of MAEs
- ❖ MAEs with potential to cause harm
- ❖ MAEs in high-risk drugs (e.g. opioids, insulin)
- ❖ MAEs with actual harm



Multilevel logistic regression adjusting for patient and clinical characteristics (e.g. patient age, route, time of administration)

Adjusted Odds Ratios (aOR). aOR of 1.0 = no change pre and post EMS; > 1.0 = increase and < 1.0 indicates decrease

Results



EMS implementation had no effect on:

- Occurrence of MAEs
Adjusted Odds Ratio aOR 1.09
(95% CI 0.89-1.32)
- MAEs with potential to cause serious harm
(aOR 1.18; 95%CI 0.9-1.56)
- MAEs in high-risk drugs
(aOR 0.74; 95%CI 0.34-1.6)
- MAEs with actual harm
(aOR 0.92; 95%CI 0.34-2.46)



Effect of EMS on MAEs by routes

MAEs in IVs increased post-EMS



Route*	Paper		EMS		IRR, EMS vs Paper (95%CI) [†]
	Dose Admin.	Total errors	Dose Admin.	Total errors	
Oral	1485	481	1792	899	1.07 (0.88-1.30)
Intravenous infusion	338	316	371	444	1.29 (1.08-1.53)
Intravenous injection	120	127	108	146	1.38 (1.05-1.82)

* Inhalation, Other non-injectables, and Other injections not shown.

[†]Adjusted for time of day, patient age, with random effects for ward, study week, nurse and patient.

IRR = Incident Rate ratio

Dose Admin.= dose administration

Prescribers required to select the type of IV



IV bolus default

Remaining Administrations:

***Route of Administration:** IV Bolus

First Dose URGENCY:

***Frequency:**

Maximum PRN dose in 24 hours:

***AMS Indication:**

Special Instructions:

Drug Form:

Order for Future Visit:

- IV Bolus
- IV Continuous Infusion
- IV Intermittent Infusion
- Jejunal
- Miscellaneous
- Nasogastric
- Nasojejunal
- Nebulised Inhalation
- Not for administration
- Oral
- Oral / Jejunal
- Oral / Nasogastric

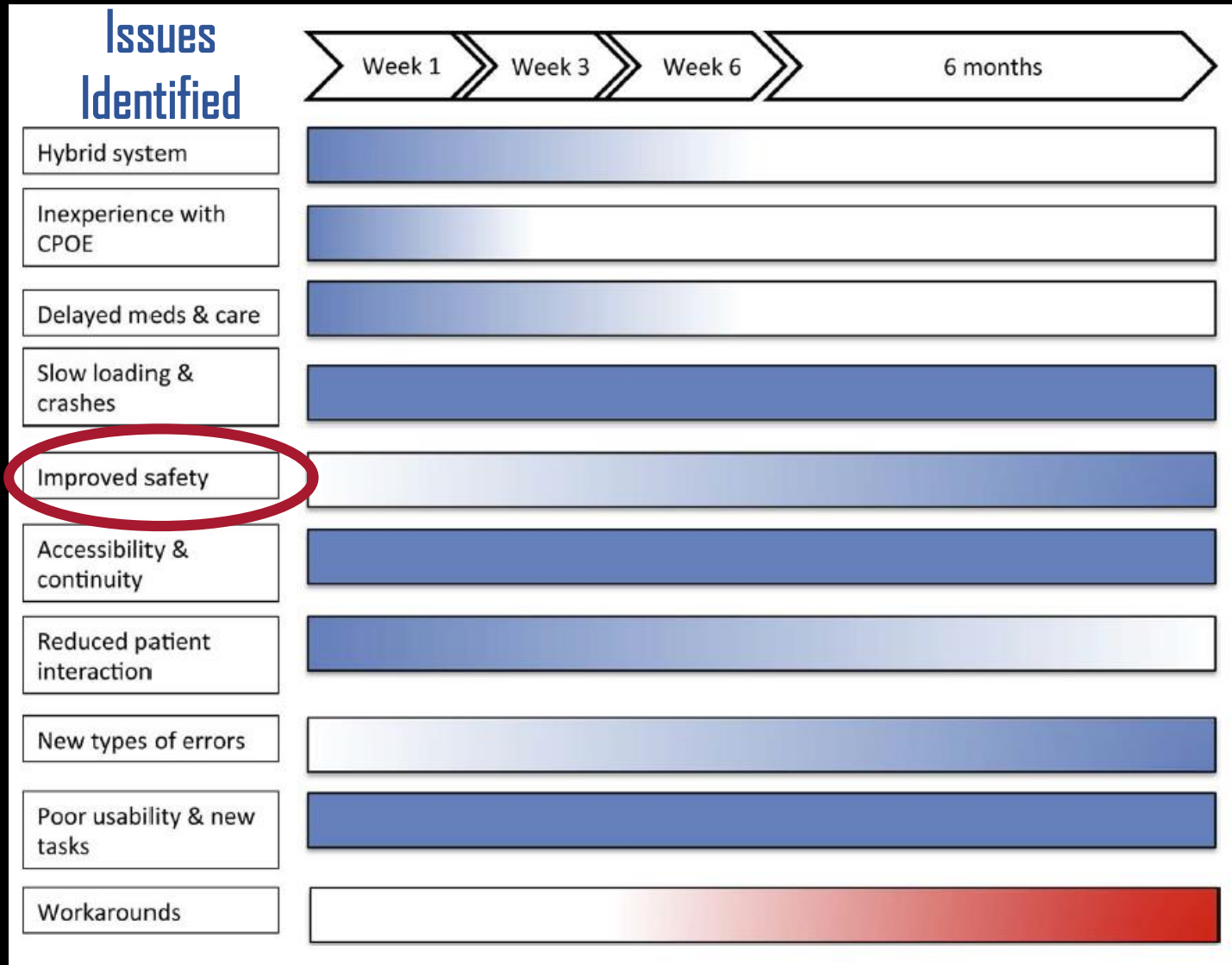
Nurses would administer according to their usual practice and often ignore Or Incorrectly use bolus



Factors which may have influenced
error rates in the first 70 days of
use



Weeks post EMS



Results of 122 interviews with drs & nurses

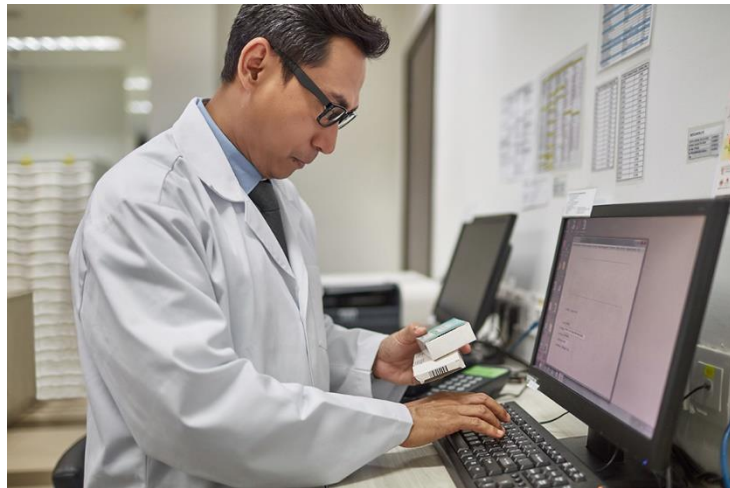
Multiple factors impacted use in the first months

Effects on Prescribing Errors



No change in prescribing error rate in first 70 days of EMS use
(incident rate ratio [IRR] 1.05 [95%CI 0.92–1.21])

One-year post-EMS, errors declined by 36%
(IRR 0.64 [95%CI 0.56–0.72])












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Short- and long-term effects of an electronic medication management system on paediatric prescribing errors

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Discussion

Early stages of EMS may increase risk

Workflow changes and system design will impact effectiveness

Few studies of impact on MAE

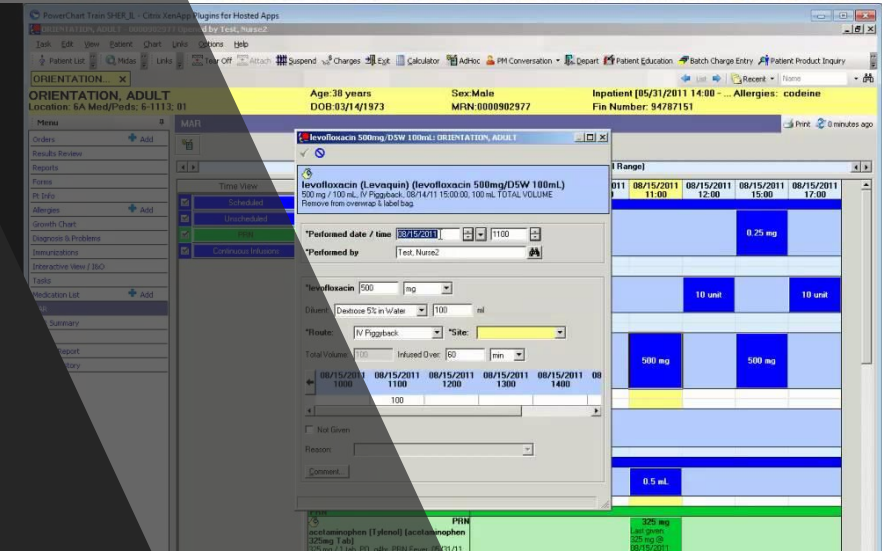
Longer term studies in adult hospitals show decreases in some MAEs

US national study -hospitals with electronic medication administration systems were 14-29% more compliant on range of quality indicators and continued to improve over time.

Print Your Name	Contact	Sign	Date	Time	Dose	Route	Sign	Continue on discharge?	Yes / No	Dispense? Duration?	Prescriber's Signature
Marcus S			12/22/10	15:20	20	PO	PC				
			12/23/10	10:10	20	PO	PC				
			12/23/10	10:10	20	PO	PC				
			12/23/10	10:10	20	PO	PC				

DOSE	ROUTE	START DATE	CEASE DATE
20mg	PO	21.4.15	

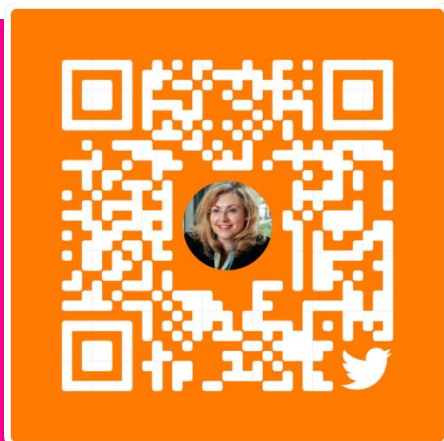
whilst on fentanyl infusion



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Raban MZ, Li L, Baysari MT, Mumford V, Prgomet M, Dong C, Fitzpatrick E, Merchant A, Kim T, Gates P, McCullagh C, Dalla-Pozza L, Karnon J, Woods A, O'Brien TA, Ambler G, Day R, Cowell CT, Gazarian M, Koyama A, Worthington R, Lehmann CU, White L, Barbaric D, Gardo A, Kelly M, Board N, Kennedy P, Barclay P, Goh S, Dickinson M, Badgery-Parker T, S Whalen.

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The Sydney
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