# A Patient Safety Initiative: Reducing Harm from Opioids Administration

Singapore Healthcare Management 2018

Andaya JDL; Camet A; Deepak M; Jayakrishnan N; Lee PM; Nah SN; Sinnappan R; Siow YN; Swaminathan K; Wan YK; Xu SR
KK Women's and Children's Hospital

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SingHealth

## Introduction

KK Women's and Children's Hospital (KKH) is a member institution within the SingHealth (SHS) Cluster. It is an academic medical institution providing tertiary service to high-risk condition in women and children. Having a diverse population of patients, Opioid administration in KKH depends on the different specialities prescribing it. There is no standard practice of opioid administration and monitoring, resulting to different practices in the management that can compromised patient care and outcome.

## Aim

To reduce harm from Opioid Administration by 30% among patients under Patient Controlled Analgesia (PCA) within 3 years in KKH.

## Methodology

A multidisciplinary team was formed comprising of Adult and Paediatric anaesthesiologists, nurses, pharmacist and representatives from Quality Safety Risk Management and Information Technology to work on the large scale initiative of safe opioid administration. The team adopted the IHI model of improvement. Problem was identified using **"Ask 5, Take 5"** approach and **Gap Analysis Tool** as shown in figure 1 & 2.

Figure 1 Ask 5, Take 5

SHINe
SINGAPORE HEALTHCARE IMPROVEMENT NETWORK

**Submission in 2 weeks in Extranet (6 May 2014)**

Workstream: Medication Safety Promotion

Primary Driver:
☐ Prevention of CAUTI ☐ Oral Hypoglycaemic agents ☐ Correct Surgery
☐ Hand Hygiene ☒ Opioids ☐ Antimicrobial Prophylaxis ☐ Prevention of VTE

Pilot Area: Ward 65 (Children) and Ward 72 (Womens)

Segment: All Patients on PCA morphine

Process to be tested: Presence of protocol, Knowledge of protocol and access to protocol, knowledge of the definition of nausea and vomiting and if there is any management workflow in place.

Measurement - Can you reliably get the data about that process and understand the gap (i.e. 5 and 5 exercise)?

☒ Yes ☐ No

What are the results of your Ask 5, Take 5?
IN terms of protocols: most know the presence of protocol but not the knowledge of what the protocol is about. There are also 2 protocols (one for women and one of children) which have confused some. There is also no specific protocol for treatment of patient with PONV.
In terms of charting, the accuracy of charting occurred in 1 chart where patient had suffered from PONV but this was not asked and not charted by nurse.

Any Other Comments:

Figure 2 Gap Analysis

**Gap Analysis Tool**

| | CURRENT SITUATION (Describe the current workflow and processes) | STRENGTH & WEAKNESSES | IDEAL PROCESS (Best Practice) | PLANS AND POSSIBLE BARRIERS |
|---|---|---|---|---|
| **Patient Education** *(Joanne)* | PCA education provided by pain service and documented in case notes/ patient family education record | Education for patient / caregiver on IV infusion and PCA use is inconsistent, inadequate and not properly documented | A PCA Pamphlet/information leaflet for patient/caregiver<br>1) Information should be given prior to surgery<br>2) Written and verbal patient education | PLAN:<br>1. Create a PCA or IV Morphine infusion pamphlet or booklet<br>2. Nurse education together with a checklist that the pain link nurse needs to go through every patient who will be on IV Morphine Infusion and PCA.<br>Checklist must include 5 key points that a patient and nurse need to complete prior to the start of the IV infusion or PCA.<br>3. Explore the possibility of implementing it using the electronic charting.<br><br>BARRIERS:<br>1. Pamphlet overload can be easily misplaced, cumbersome and patient/caregiver may not be reading it.<br>Cost of electronic charting |
| **Ordering /Prescription** *(Dr Kelvin)* | 1) Diverse prescribing practices as KKH caters for both women and children<br>2) Frequent rotation of doctors that may not be familiar with the workflow or electronic ordering<br>3) No standard algorithm or guideline and no consistency in the management<br>4) Too many options in the order set<br>5) No standard dilution used and variable units used for ordering<br>6) Morphine infusion is delivered via normal syringe pumps in open ward: not tamper proof. | 1) Variation in prescribing practice<br>2) No limitation as to who can prescribe<br>3) No restriction on the locality of ordering opioids<br>4) Rescue drugs for side effects is not mandatory<br>5) Verification of order by 2 doctors as opioids belong to High Alert Medication | 1) A standardised algorithm and dose ordering which includes standard dilutions, initial settings for the PCA, rescue and resuscitation medications<br>2) Verification process between 2 physicians.<br>3) Limited prescribing privileges<br>4) Limit areas of use for opioid infusion and PCA<br>5) Rescue order set (e.g. anti-emetic and anti-pruritic)<br>6) Rescue chart prominently displayed<br>7) Safety checklist<br>8) Use of smart pumps with anti-tamper facilities e.g. with lock code. | PLAN:<br>1) To work with CLMM and Nurse charting workgroup to create a module for opioids order and dilution set.<br>2) Mandatory to order rescue drugs (e.g. Naloxone and anti-emetic drugs<br>3) To put a hard stop if there is variation of orders.<br>4) Competency checklist before doctors can order opioids<br><br>BARRIERS:<br>1) Too many stakeholders as KKH caters for women and children where clinicians has diverse personal algorithms<br>2) Difficult to have general consensus within the department as well as visiting physicians<br>3) Software accommodation to limit both per kg and flat doses in a single set<br>4) Failure to use appropriate order set |
| **Patient assessment/ Nurse monitoring** *(Lydia & Karpagam)* | 1) Current practice is Morphine IV infusion is handled by Surgery and PCA is handled by the Anaesthetist<br>2) IV infusion monitoring chart only includes pain score, respiratory rate, SAO2 and pulse rate without side effect monitoring while PCA has a detailed monitoring parameters. | 1) No standardized monitoring chart and no algorithm for the management of side effect<br>2) Monitoring frequency is not determined and how to escalate or de-escalate is not well-defined.<br>3) | 1) Monitor chart for side effects such as nausea, vomiting, itch, constipation<br>2) Pain score monitoring and charting for infusion and PCA should be standardized.<br>3) Electronic charts should have intervention prompts flashed out when nurse detect low RR, desaturation, Nausea and vomiting etc<br>4) Single rooms for at risk patients: these patients should not be nursed in a single room. What is the scope of the problem.<br>5) SPO2: should be continuous for at risk patients. | PLAN:<br>1) Create a common charting opioid side effects<br>2) Clearly defined the range of the different parameters to set the RED FLAG values.<br>3) Create a drop down list of side effects in the electronic charting and to include the appropriate management. |
| **Identification and Management of Side Effects** *(Jaslyn &* | | 1) There is no standing order for the management of side effects for paediatrics while women has standing order for acute pain service | 1) A standard protocol/workflow /guideline and detailed monitoring chart of side effects<br>2) An algorithm for the management of side effects | 1) To create an algorithm for the monitoring and management of side effects including the monitoring frequency.<br>2) A more defined and detailed assessment and monitoring of the different side effects in the |
| *Jenny)* | | 2) There is no algorithm for the management of side effects<br>3) The standing for Acute Pain Service in Women has not been updated.<br>4) There is no standard protocol/guideline for detailed monitoring of side effects for both women and children | 3) PCA and IV infusion should have rescue drugs ordered and 1st dose given in OT.<br>4) Peads and O&G nurses can give the 1st dose of Ondansetron. | electronic charting. |
| **Protocol** *(Dr Siow, Dr Wan & Dr Deepak)* | 1) There is variation in the protocol for Women and Children tower.<br>2) There is no precise algorithm for identification, assessment and monitoring of side effects<br>3) This includes the frequency of monitoring, what to monitor, escalation and de-escalation and management. | No standard and comprehensive protocol | 1) Standard protocol or guideline for opioids<br>2) SpO2 should be mandatory monitoring, preferably continuous for at risk patients<br>3) Define at risk: includes continuous infusions.<br>4) Et CO2 should be considered for Opioid administration in patient needing supplemental O2<br>5) Algorithm for immediate steps in the event of low SpO2, low respiratory rate, increase nausea and vomiting and other side effect.<br>(e.g. STOP Opioid and call doctor for low SpO2, <95%<br>6) Checklist for initiation of PCA/Opioid infusions | 1) To work with CLMM workgroup to explore standardizing the ordering and prescribing of opioids for IV infusion and PCA<br>2) To explore on the use of electronic charting for the Opioids protocol<br>3) To unify the protocol for opioids used in IV infusion and PCA<br>4) To create an educational booklet/pamphlet for patient and caregiver.<br>5) To create a checklist for nurse education and training. |

Creation and implementation of a **protocol checklist** for the patients on PCA as shown in Figure 3.

Figure 3 Protocol Checklist

SHINe
(Opioid Safety Initiative under Singapore Healthcare Improvement Network)
Safety Checklist for Patients receiving Postoperative Parenteral Opioids
(Infusions, PCA, Epidural, Intrathecal)
To take action: Anaesthetist, PACU nurse, Ward Nurse

Ward/Bed:_____ Affix patient sticky label

This checklist is mandatory for patients receiving opioids via PCA or Intra-thecal/Epidural routes.

| A) ACTION BY ANAESTHETIST (Prescription and screening) | |
|---|---|
| 1) | Please order anti-emetics in CLMM. |
| 2) | Evaluate presence of **ANY** risk factors **for opioid induced respiratory depression:** *Examples:* |
| a. | BMI > 37.5 or body weight more than 110 Kg |
| b. | Patients with known or suspected OSA |
| c. | Advanced age |
| d. | Severe preeclampsia with patient on magnesium sulphate |
| e. | Previous upper airway surgery or disease, thyroid goitre, Down's Syndrome or other congenital/acquired anomalies with airway involvement etc. |
| f. | Chronic lung disease, e.g. emphysema, brittle asthma, chronic bronchitis, unresolved pleural effusion etc. |
| g. | Previous lung reduction surgery like lobectomy or pneumonectomy. |
| h. | Acute respiratory compromise from unresolved pneumonia, pulmonary embolus, pulmonary oedema etc. |
| i. | If patient is on Oxygen Supplementation |
| j. | Others: |

Are any of the above risk factors present? ☐ Yes ☐ No
If yes, patient must be monitored with Continuous SPO2 monitoring in an appropriate care area

Name (Anaesthetist completing the form): _____ MCR: _____

Signature: _____ Date/Time: _____

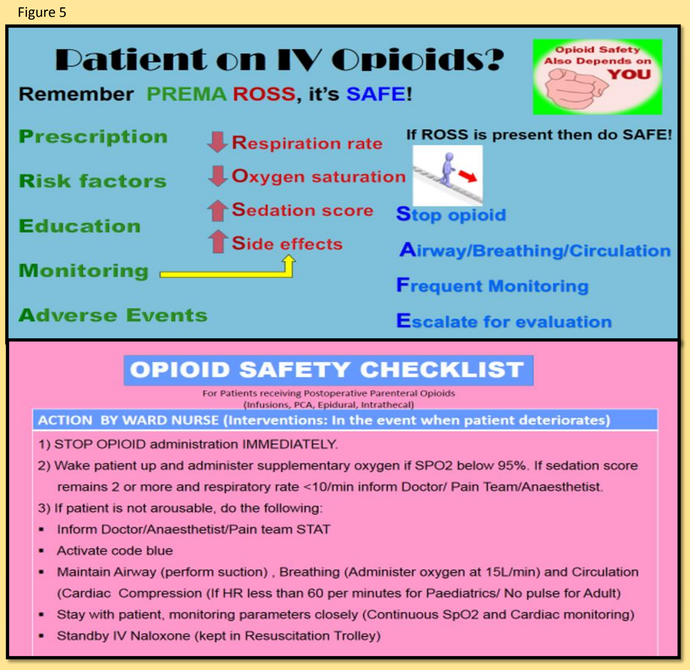
Adverse effects during first 24 hrs of starting therapy? ☐ Yes ☐ No
Eg. Sedation score > 2
Respiratory rate < 10
SpO2 < 95%

Please detach the Checklist from Pain audit form and attach to the patient"s case folder

This checklist is mandatory for patients receiving opioids via PCA or Intra-thecal/Epidural routes.
A) ACTION BY ANAESTHETIST (Prescription and screening)
1) Please order anti-emetics in CLMM.
2) Evaluate presence of ANY risk factors for opioid induced respiratory depression:
Examples:
a. BMI > 37.5 or body weight more than 110 Kg
b. Patients with known or suspected OSA
c. Advanced age
d. Severe preeclampsia with patient on magnesium sulphate
e. Previous upper airway surgery or disease, thyroid goitre, Down's Syndrome or other congenital/acquired anomalies with airway involvement etc.
f. Chronic lung disease, e.g. emphysema, brittle asthma, chronic bronchitis, unresolved pleural effusion etc.
g. Previous lung reduction surgery like lobectomy or pneumonectomy.
h. Acute respiratory compromise from unresolved pneumonia, pulmonary embolus, pulmonary oedema etc.
i. If patient is on Oxygen Supplementation
j. Others:
Are any of the above risk factors present? ☐ Yes ☐ No
If Yes, patient must be monitored with Continuous SPO2 monitoring in an appropriate care area
Name (Anaesthetist completing the form): _____ MCR: _____
Signature: _____ Date/time: _____
Adverse effects during first 24 hrs of starting therapy? ☐ Yes ☐ No
Eg. Sedation score > 2
Respiratory rate < 10
SpO2 < 95%
Please detach the Checklist from Pain audit form and attach to the patient's case folder

Development of the **reminder card** to aid the nurses on Opioid Safety (Figure 5).

Figure 5




**Revision of the Policies and Procedure** to standardize the practices in monitoring of patients on Opioids under PCA across the woman and children as shown in figure 7.

Figure 7

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KK WOMEN'S AND CHILDREN'S HOSPITAL
Work Instruction

| | | | |
|---|---|---|---|
| Title/Description: | Management of Patients on Patient Controlled Analgesia (PCA) | | |
| Department: | Division of Nursing | Effective Date: | 01-04-2017 |
| Procedure No: | 60110-1073<br>Replace:<br>60110-2003 & 60110-6027 | Revision No: | - |
| Revision Date: | - | Approved By: | |
| Applies To: | All Nursing Staff & PCA – Wards/Unit | | Chief Nurse |

For sustainability and spread, the development of **PCA education checklist** to provide nurses a systematic way of educating patient and caregiver on Opioids (Figure 4). The team also engaged the patient and caregiver by getting their feedback on the usefulness of the checklist.

Figure 4


**Prescriptions via Electronic Closed Loop Medication Management System (CLMM)**
The team worked with CLMM committee and Nursing Charting workgroup to produce consistent order sets to reduce medication error. (Figure 6)

Figure 6

Paediatric Anaesthesia order set:

| Medication Name | Start Date | Order Priority | Route | Dose | UOM | Calc Dose Info | Frequency | Base Solution | PRN | PRN Reason | OrderDetails/Instructions | Dosing Information |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PCA BW < 50 kg - 2 item(s) | | | | | | | | | | | | |
| PCA Morphine | T | Routine | IV Continuous | | mg | | <Continuous> | Sodium... | | | ** No other parenteral Sedative or Opioid unless ordered... | Max Dose: 50 mg |
| PCA Fentanyl | T | Routine | IV Continuous | | mcg | | <Continuous> | Sodium... | | | ** No other parenteral Sedative or Opioid unless ordered... | Max Dose: 500 mcg |
| PCA BW < 50 kg via CADD - 2 item(s) | | | | | | | | | | | | |
| PCA Morphine | T | Routine | IV Continuous | | mg | | <Continuous> | Sodium... | | | ** via Continuous Ambulatory Delivery Device (CADD)... | Max Dose: 50 mg |
| PCA Fentanyl | T | Routine | IV Continuous | | mcg | | <Continuous> | Sodium... | | | ** via Continuous Ambulatory Delivery Device (CADD)... | Max Dose: 500 mcg |
| BW < 50kg Add KETAMINE_CADD - 1 item(s) | | | | | | | | | | | | |
| PCA Morphine | T | Routine | IV Continuous | | mg | | <Continuous> | Sodium... | | | ** via Continuous Ambulatory Delivery Device (CADD)... | Max Dose: 50 mg |
| PCA BW >= 50 kg - 2 item(s) | | | | | | | | | | | | |
| PCA Morphine | T | Routine | IV Continuous | 50 | mg | | <Continuous> | Sodium... | | | ** No other parenteral Sedative or Opioid unless ordered... | Max Dose: 50 mg |
| PCA Fentanyl | T | Routine | IV Continuous | 500 | mcg | | <Continuous> | Sodium... | | | ** No other parenteral Sedative or Opioid unless ordered... | Max Dose: 500 mcg |
| PCA BW >= 50 kg via CADD - 2 item(s) | | | | | | | | | | | | |
| PCA Morphine | T | Routine | IV Continuous | 50 | mg | | <Continuous> | Sodium... | | | ** via Continuous Ambulatory Delivery Device (CADD)... | Max Dose: 50 mg |
| PCA Fentanyl | T | Routine | IV Continuous | 500 | mcg | | <Continuous> | Sodium... | | | ** via Continuous Ambulatory Delivery Device (CADD)... | Max Dose: 500 mcg |
| BW >=50 kg Add KETAMINE_CADD - 1 item(s) | | | | | | | | | | | | |
| PCA Morphine | T | Routine | IV Continuous | 50 | mg | | <Continuous> | Sodium... | | | ** via Continuous Ambulatory Delivery Device (CADD)... | Max Dose: 50mg |
| NCA BW < 50kg - 2 item(s) | | | | | | | | | | | | |
| NCA Morphine | T | Routine | IV Continuous | | mg | | <Continuous> | Sodium... | | | ** No other parenteral Sedative or Opioid unless ordered... | Max Dose: 50 mg |
| NCA Fentanyl | T | Routine | IV Continuous | | mcg | | <Continuous> | Sodium... | | | ** No other parenteral Sedative or Opioid unless ordered... | Max Dose: 500 mcg |
| NCA BW < 50kg via CADD - 2 item(s) | | | | | | | | | | | | |
| NCA Morphine | T | Routine | IV Continuous | | mg | | <Continuous> | Sodium... | | | ** via Continuous Ambulatory Delivery Device (CADD)... | Max Dose: 50 mg |
| NCA Fentanyl | T | Routine | IV Continuous | | mcg | | <Continuous> | Sodium... | | | ** via Continuous Ambulatory Delivery Device (CADD)... | Max Dose: 500 mcg |
| NCA BW >= 50kg - 2 item(s) | | | | | | | | | | | | |
| NCA Morphine | T | Routine | IV Continuous | 50 | mg | | <Continuous> | Sodium... | | | ** No other parenteral Sedative or Opioid unless ordered... | Max Dose: 50 mg |
| NCA Fentanyl | T | Routine | IV Continuous | 500 | mcg | | <Continuous> | Sodium... | | | ** No other parenteral Sedative or Opioid unless ordered... | Max Dose: 500 mcg |
| NCA BW >= 50kg via CADD - 2 item(s) | | | | | | | | | | | | |
| NCA Morphine | T | Routine | IV Continuous | 50 | mg | | <Continuous> | Sodium... | | | ** via Continuous Ambulatory Delivery Device (CADD)... | Max Dose: 50 mg |
| NCA Fentanyl | T | Routine | IV Continuous | 500 | mcg | | <Continuous> | Sodium... | | | ** via Continuous Ambulatory Delivery Device (CADD)... | Max Dose: 500 mcg |

Woman Anaesthesia order set

| Medication Name | Start Date | Order Priority | Route | Dose | UOM | Calc Dose Info | Frequency | Base Solution | PRN | PRN Reason | OrderDetails/Instructions | Dosing Information |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PCA 1-5-6-40 - 1 item(s) | | | | | | | | | | | | |
| PCA Morphine | T | Routine | IV Continuous | 40 | mg | | <Continuous> | Sodium... | | | No other parenteral Sedative or Opioid unless ordered by... | |
| PCA-1-5-8-40 - 1 item(s) | | | | | | | | | | | | |
| PCA Morphine | T | Routine | IV Continuous | 40 | mg | | <Continuous> | Sodium... | | | No other parenteral Sedative or Opioid unless ordered by... | |
| PCA-1-5-8-50 - 1 item(s) | | | | | | | | | | | | |
| PCA Morphine | T | Routine | IV Continuous | 50 | mg | | <Continuous> | Sodium... | | | No other parenteral Sedative or Opioid unless ordered by... | |
| PCA-1-5-10-40 - 1 item(s) | | | | | | | | | | | | |
| PCA Morphine | T | Routine | IV Continuous | 40 | mg | | <Continuous> | Sodium... | | | No other parenteral Sedative or Opioid unless ordered by... | |
| PCA-1-5-10-50 - 1 item(s) | | | | | | | | | | | | |
| PCA Morphine | T | Routine | IV Continuous | 50 | mg | | <Continuous> | Sodium... | | | No other parenteral Sedative or Opioid unless ordered by... | |

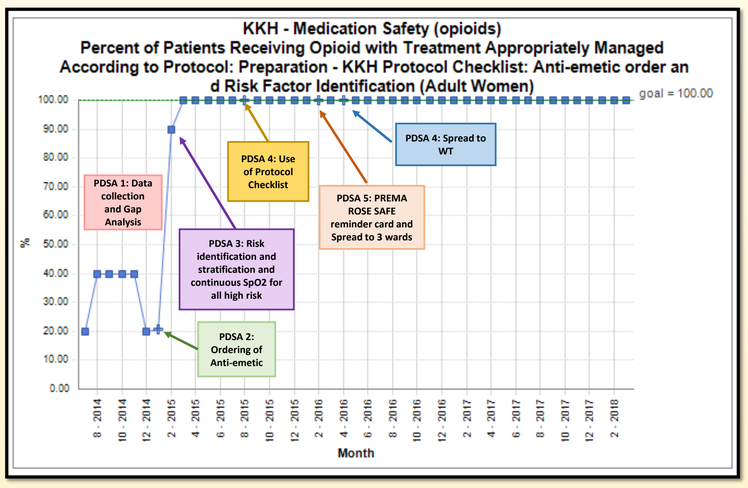
**Tutorial sessions** were provided to nurses by the anesthetist on Opioid Safety and follow-up session with Pain Resource Nurses to train the nurses on Opioid Safety (Figure 8)

Figure 8


## Result

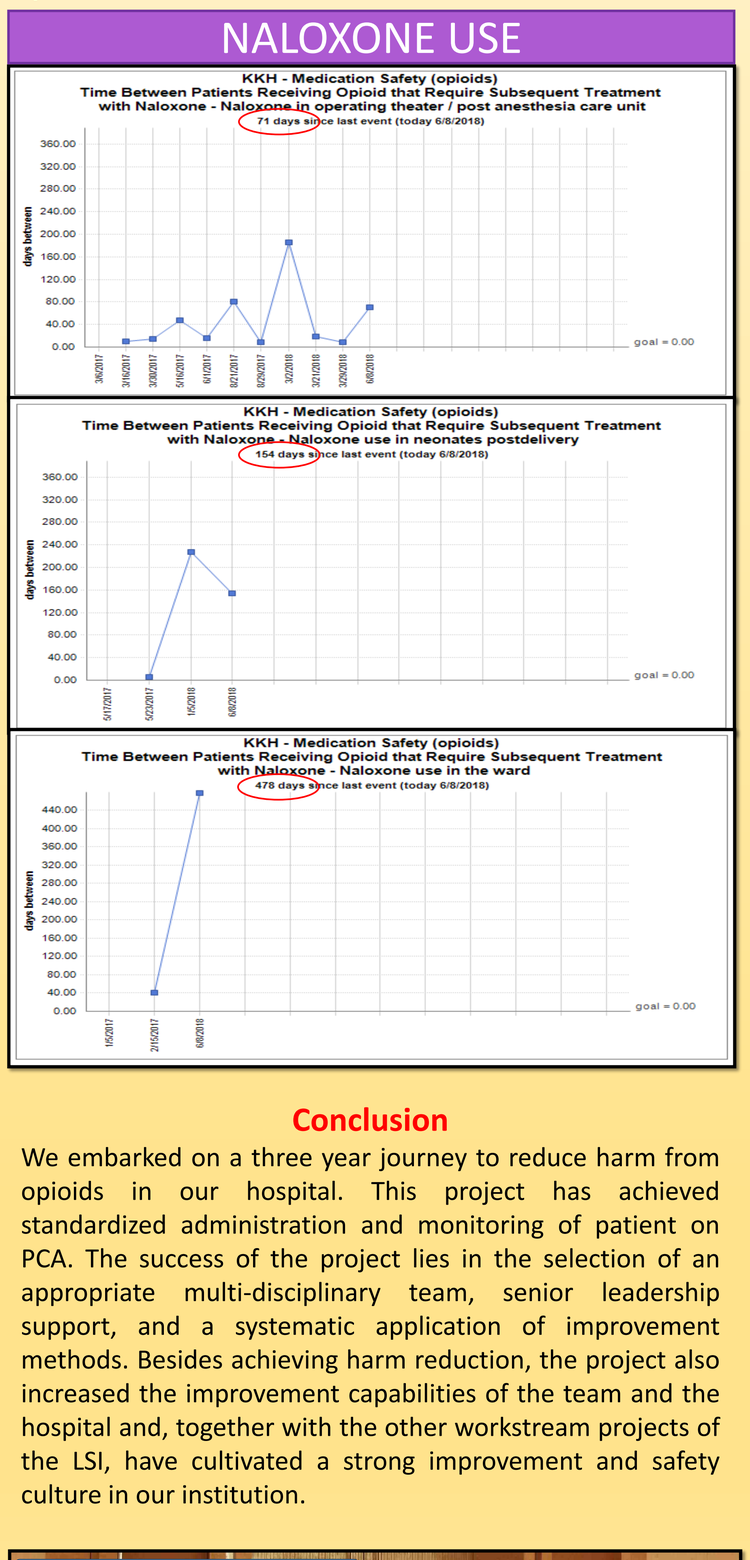
The pilot and spread units show good compliance with the PCA Opioid Safety Checklist. The process measure is the percent of patients receiving Opioid with treatment appropriately managed according to protocol: Preparation, figure 9 showed 100% compliance.

Figure 9




The outcome measures are the days to last use of naloxone for reversal of opioid side effects. (Figure 10). Number of cases identified with over-sedation, desaturation while being monitored by pulse oximetry. Naloxone use is monitored since the last event in 3 areas: Operating Theatre/Post Anaesthetic Care Unit (71 days), Neonates Post-delivery (154 days) and General Ward (478 days).

Figure 10




## Conclusion

We embarked on a three year journey to reduce harm from opioids in our hospital. This project has achieved standardized administration and monitoring of patient on PCA. The success of the project lies in the selection of an appropriate multi-disciplinary team, senior leadership support, and a systematic application of improvement methods. Besides achieving harm reduction, the project also increased the improvement capabilities of the team and the hospital and, together with the other workstream projects of the LSI, have cultivated a strong improvement and safety culture in our institution.


PATIENTS AT THE HEART OF ALL WE DO