

A Quality initiative: Hand calculations to clinical 'app'- SCIMA

Transforming nurses preparation of subcutaneous infusions

Scott Crawford, Jonathan Adler - Palliative Care Directorate, Wellington Regional hospital

Context:

- Subcutaneous (SC) infusions deliver multiple medications continuously, usually at the patients end of life; in the hospital, hospice or community.
- Although seen as a core nursing competence, performing the medication volume calculations manually at times can be a daunting task
- Often there exists poor confidence completing the calculations and making decisions about the appropriate syringe volume, diluent and correctly identifying medication compatibility issues.

Problem:

- Anecdotally, high numbers of errors or 'near misses' occur in the preparation process, often in patients with limited physical and emotional reserve to cope with errors.
- This is exacerbated by increasing clinical ward pressures, and increasingly complex medication combinations.
- No DHB policy mandating the recording of hand calculations, making retrospective adverse event reviews difficult.

Intervention:

- Adopting a 'Smart system' approach, a web based application was developed called SCIMA (Subcutaneous Infusion Medication Application), which automates the calculations/decisions involved in the preparation process.
- Developed by the Capital and Coast DHB (CCDHB) IT department through partnership with the Palliative care Directorate and Pharmacy.

SCIMA's primary objective is:

- Mitigating patient harm events/reduce medication errors through the automation of the preparation process.
- Supporting nursing staff and enhance confidence during the SC infusion preparation process.

LINKED - with the patients NHI

ENTER - required medications and dosage

CALCULATES - the medication volume required, diluent volume/type, syringe size

HIGHLIGHTS - possible medication incompatibilities

CREATES - a printable and recallable 'Preparation Order' - essentially a 'How to prepare guide'

Pilot

- A real world single ward pilot was run over 4 weeks.

Primary outcome

- To assess the practical feasibility, clinical safety and impact on nursing confidence of using SCIMA

Secondary outcomes

- Collate feedback to inform future versions of SCIMA.
- Establishing a data set of all SC infusions prepared for future analysis.

Methodology

- A mixed semi-quantitative/qualitative assessment method.
- Combining Linkert scale questionnaires to assess nursing confidence pre/post pilot
- Free text response to document experiences/effect on practice
- Review of each clinic 'use' to ensure clinical accuracy/safety.

The screenshots show the SCIMA interface from login to the final preparation order. Key features include:

- Login:** Username and password fields with a 'Login' button.
- Patient Selection:** Search for patient by NHI, name, or date of birth.
- Medication Check:** Confirmation of medication concentrations (e.g., Morphine sulphate 30mg/1ml).
- Preparation Order:** A list of previous orders and a detailed view of the current order, including medication names, doses, and volumes.
- Medication Table:** A table with columns for Medication, Dose, and Concentration of Ampoule.
- Volume of syringe selected:** A dropdown menu to choose the syringe size (e.g., 20ml).
- Duration of syringe driver:** A dropdown menu to choose the duration (e.g., 24Hrs).
- Preparation Order:** A list of instructions for drawing up the syringe, such as 'Draw into syringe 5ml of Morphine sulphate from a total of 30mg/1ml Ampoules of 30mg/1ml'.
- Medication Compatibility Alert:** A warning box for Dexamethasone, stating it should be the last component added to the syringe.

Examples of the SCIMA interface

Syringe Driver Preparation Instructions

Date: 13/09/2018 09:57
Patient NHI: QAF2510
Surname: DO NOT USE First name: THIS, NHI Date of birth: 19/11/1989

Patient Alerts - From MAP

Type	Description	Comment	Date
Drug Allergies	Penicillins	GO LIVE BRUSH TEST	03/10/2012
Drug Allergies	Other - View Details	Fentanyl	01/09/2017
Anaesthetic Drugs	Tramadol	test test	20/09/2017
Condition Alerts	CALL HAEMATOLOGIST	Awaiting lung transplant	31/05/2018

Medications Allergies/Intolerances

Cephazolin - RASH

Syringe Prescription - Doctor prescribing: DOCTOR DOCTOR MCNZ 55555

Medication	Dosage	Concentration of Ampoule
1 Morphine sulphate	150mg	30mg/1ml
2 Haloperidol	5mg	5mg/1ml
3 Dexamethasone	1mg	4mg/1ml

Volume of syringe selected: 20ml
Duration of syringe driver: 24Hrs

Preparation Order:

Draw into syringe 5ml of Morphine sulphate from a total of 30mg/1ml Ampoules of 30mg/1ml
Then Draw into syringe 1ml of Haloperidol from a total of 5mg/1ml Ampoules of 5mg/1ml
Then Draw into syringe 11.75 ml of Sterile 0.9% Sodium Chloride
Then Draw into syringe 0.25ml of Dexamethasone from a total of 4mg/1ml Ampoules of 4mg/1ml

Medication Compatibility Alert

Alert
Dexamethasone - Dexamethasone should be the last component added to the maximally diluted syringe. There may be initial transient turbidity upon the addition of dexamethasone. Exercise caution when using in combination and monitor for signs of incompatibility (www.palliativevdrugs.com, McLeod, Vella-Britnat & Macleod 2012)

Haloperidol and Dexamethasone - Some known episodes of incompatibility at higher doses of either drug - Exercise caution when using in combination and monitor for signs of incompatibility (www.palliativevdrugs.com)

Results

Application 'Uses'

- 87 Valid uses for 21 patients.
- Potential events - 123 events with 36 missed events (70.8% uptake rate)
 - * Allowance for feeling uncertain or uncomfortable using an unfamiliar tool.
- Most cited reason for not using SCIMA
 - * Clinical ward was too busy
 - * Relative simplicity (i.e. 1 drug, no compatibility errors)

Clinical safety

- No reportable events
- All relevant calculated data was correct based on the information entered. (medication/syringe volumes, number of ampoules required, diluent volume/type, errors)
- All compatibility errors (4) between medications were correctly identified.

'I have had two patients on dexamethasone in there (sic) SCP drivers - when first drawing this up I did not use SCIMA, I did not realise that I had to put the dex (sic) in last. The solution went cloudy and I realised that something was not quite right'. 'I then put the medications and dosages into SCIMA which told me that the dex (sic) needed to go in last, this helped greatly'.

This was a great tool to work out SCP medications and alerts without looking it up on separate systems - it makes in easier being all there on one tool.'

- One transcription error occurred
 - Data entered was incorrect - 15mg of Haloperidol instead of 1.5mg
 - However no clinical harm resulted and it was rectified quickly.

Confidence

- Generally high levels of confidence throughout (see Table 1.) Overall average confidence increased across all aspects.
- Notable increases in confidence *'finding additional resources I may need'* (3.79 → 4.40 out of 5)
- Relative lower levels of confidence *'... finding additional resources I may need to successfully prepare a SC infusion'*, (3.79 out of 5)
- '... identifying medication compatibility issues which may exist'* (average 4.05 out of 5)
- Confidence with opiates vs Benzo's *'I am confident about preparing a SC infusion which contains ... a benzodiazepine medication'* (3.74 out of 5) vs *'... a opiate medication'* (4.32 out of 5).

Overall satisfaction increased
Current process (4.11 out of 5) → Using SCIMA (4.40 out of 5).

Majority of respondents felt that SCIMA 'increased their confidence' (11 of 15 respondents)

Majority would be 'very likely' to recommend SCIMA to their colleagues (10 of 15 respondents) – average 4.67 out of 5.

Table 1 : Pre-/post pilot average responses

I am confident about

	Average of responses Pre pilot (n=19)	Post pilot (n = 15)
1. preparing a Subcutaneous (SC) Infusion	4.58	4.73
2.calculating the medication volume for each component of a SC infusion	4.58	4.80
3. finding additional resources I may need to successfully prepare a SC infusion	3.79	4.40
4. preparing a SC infusion with 3 or more medications	4.37	4.73
5. selecting the appropriate diluent to complete the syringe	4.26	4.60
6. calculating the required appropriate diluent volume	4.05	4.60
7. selecting the appropriate syringe size	4.26	4.87
8. identifying medication compatibility issues which may exist	4.05	4.40
9. preparing a SC infusion which contains an opiate medication	4.32	4.73
10. preparing a SC infusion which contains a benzodiazepine medication	3.74	4.07
11. preparing a SC infusion when there is more than one ampoule size available	4.11	4.60

Free text Feedback

- What would you change about the current process?
 - "More accessible information about incompatibilities as we used to have a specific SC incompatibility chart which is no longer easily visible"*
 - "Availability of drug compatibility information"*
 - "Clearer/more easily accessible reference of drug compatibility and diluent compatibility data"*
- What worked well?
 - 'Very easy to use.... Easy to enter information ... gave me all the information I needed'*
 - 'I like it. All the information I need in preparing the meds is there'*
 - ' Gives us the idea right away if drugs are incompatible and what syringe size to use'*
 - 'Step by step process of adding multiple drugs and how much diluent to use'*

Conclusion

- Overall successful implementation of SCIMA
- Primary objective achieved (increase nursing confidence, clinical safety)
- Uptake of the clinical tool was relatively high
- Further work/analysis needs to be undertaken to identify barriers to increasing uptake.
- Large volume of feedback to IT to improve user experience –Version 2
- Large data set of all SC infusion used - prescribing trends can be easily analysed.
- New practical learning points - in-cooperated into future education programs.

The Future

- Development of an online teaching module to 'teach SCIMA' - Connect Me
- Roll out to other wards with in the DHB
- Roll out to District nurses and Community hospice
- Explore integration into commercial electronic prescribing systems