AUSTRALIAN COMMISSION ON SAFETY AND QUALITY IN HEALTH CARE

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AUSTRALIAN COMMISSION ON SAFETY AND QUALITY IN HEALTH CARE

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Australian Council for Safety and Quality in Health Care
National Inpatient Medication Chart Pilot
Aggregate Data Report

A Report from the Office of the Safety and Quality Council

Executive Summary

Background to the National Inpatient Medication Chart

In July 2003, the Australian Council for Safety and Quality in Health Care (the Council) set up the National Medication Chart Working Group (NMCWG) to provide leadership and direction to reduce patient harm resulting from error in medication documentation processes. The introduction of a National Inpatient Medication Chart (NIMC) was considered to be a significant quality improvement strategy aimed at addressing safety and quality issues associated with prescription, supply and administration of medications in hospitals. Quality and safety improvements were proposed through standardising processes of communication, optimising work flow patterns to reduce the potential for error and introducing functions to improve the safe effective and efficient use of medicines. [1]

Queensland's Safe Medication Practice Unit through the Adverse Drug Event Prevention Project (ADEPP) had already begun development and implementation of a standard medication chart across the state. Building on the significant work of Queensland in this area, in August 2004 the NMCWG finalised the NIMC and agreed on a process for piloting the NIMC at interested facilities across Australia.

The purpose of the pilot was to facilitate jurisdictions implementing the chart in order to meet the recommendation made at the Australian Health Minister's Conference in April 2004, that stated:

> *"To reduce the harm to patients from medication errors, by June 2006, all public hospitals will be using a common medication chart. This means that the same chart will be used wherever a doctor or nurse works and wherever the patient is within a hospital".*
> *Australian Health Ministers' Joint Communiqué, 23 April 2004*

The pilot of the NIMC was designed to identify the different implementation processes and tools required for different health settings prior to the national implementation of the medication chart, and identify areas of medication safety that could be targeted for continuing improvement of patient safety.

NIMC - Key Points

- Patient harm resulting from adverse medication events is a major health problem.
- Reduction of harm to patients can be facilitated by standardising communication of medication information between doctors, nurses and pharmacists working in all geographic areas (metropolitan/rural/remote).
- Outcomes from the NIMC pilot suggest that implementation of NIMC is associated with improvement in patient safety and quality of patient care, including:
  - Evidence that improvement and change in behaviour can occur through the introduction of the NIMC
  - Evidence that involvement of ALL clinicians provides opportunities for further significant improvement in medication safety.
  - An opportunity for a multidisciplinary approach to objectively identify, examine and improve the different components of the medication management pathway.[2]
- The NIMC, when implemented nationally, will ensure that every person involved in the processes of prescribing, dispensing, administration and review of medicines will use the same document. A standard approach will:
  - Allow health professionals to practice in different facilities utilising a common process.
  - Significantly reduce the risk of adverse events and patient harm resulting from clinicians' unfamiliarity and individual hospitals' unique practices and systems.
  - Facilitate education and training of health professionals and students across Australia.
  - Provide an essential pre-cursor for the development and introduction of electronic medicines management, using the standardised features of the chart, and the standardised processes which accompany its use.
- Development of the NIMC, based on behavioural studies, is one of a suite of initiatives needed to address medication safety in Australia.
- *It is recognised that effort and practice change is essential, resources are required to support this initiative, and that ongoing coordination and leadership at all levels will be required to fully realise its benefits for patient safety.*

NIMC Pilot Methodology

Following a preliminary presentation in June 2004 to obtain expressions of interest for participating in a pilot study, the Council held pre-implementation workshops in Sydney and Adelaide in October 2004 for facilities around Australia who were interested in piloting the NIMC. The workshops utilised learnings from the Queensland experience and emphasised the importance of implementation of the chart as part of a broad, education program on medication safety, with high level executive support, multidisciplinary cooperation and appropriate resourcing. A total of 31 sites participated in the NIMC Pilot (January – May 2005), including public and private facilities across metropolitan, regional and rural/remote areas. A full list of participating hospitals is at Appendix A.

Individual hospitals participating in the pilot were provided with a NIMC Pilot CD-ROM toolkit, containing background material about the NIMC. The material supported implementation as part of a coordinated education program (eg. see Appendix B for the summary rationale for a national medication chart). Also included on the toolkit were copies of the chart, NIMC guidelines, rationale and auditing tools.

Audit Data

Participating hospitals were required to conduct pre-implementation audits of their current medication chart/s to establish a baseline, prior to implementation of the NIMC. A post-implementation audit was completed by 28 (90%) of participating sites 3 months after

implementation of the NIMC. The data from pre and post-implementation audits were submitted to the Office of the Safety and Quality Council in May 2005.

The overall purpose of the pre and post-implementation audits was to measure the impact of the implementation of the NIMC so as to inform the rollout of the chart nationally in accordance with the recommendation from Health Ministers. The audits have established baselines for a process of continuous quality improvement aiming for 100% in all areas. It is acknowledged that the audit data provide information about surrogate measures of patient harm, rather than direct measures of patient harm. Further evaluation of processes, including measurement of harm, should be considered in the future. In the meantime, these audits have helped to identify areas which could be targeted for further improvement as well as opportunities for staff education to improve processes to enhance patient safety with medications.

NIMC Pilot Aggregate Data Report – Summary of Results

The NIMC Pilot Aggregate Data Report provides a comparison of baseline results with data following the implementation of the NIMC, with the averages calculated from both pre and post-implementation audits. Pre and post-implementation audit averages were calculated using the average for each data point calculated from 28 NIMC pilot sites.

The general trend of the data demonstrates improvement in medication documentation processes across the sites participating in the NIMC pilot. There is, however, opportunity for further improvement in most aspects of documentation. A summary of the data appears in the table below, describing the selected features of the NIMC, their importance for patient safety, and outlining the NIMC pilot outcomes for these audit fields.

References:

1 Barber N, Rawlins, Dean-Franklin. Reducing prescribing error: competence, control and culture. Qual Saf Health Care 2003;12(Suppl 1):i29-i32

2 Stowasser DA, Allinson YM, O'Leary KM. Understanding the medicines management pathway. Journal of Pharmacy Practice and Research 2004;34(4):293-296.

INDICATOR AND RATIONALE	NIMC PILOT OUTCOMES
Patient demographics (identifiers and weight) (see Section 2)	**(%pre audit vs %post audit)**
Printing the patient's name below their ID label on the medication chart is a checking mechanism to ensure the correct patient and the correct chart is selected.	Documentation of patient name below patient identification labels improved from 23% pre to 35% post.
Many high-risk and paediatric medication doses are calculated using bodyweight. Where patient weight is not available, inaccurate dosing may result.	Recording of patient weight demonstrated insignificant overall change: 20% pre to 18% post. Data was not separated out for paediatric subgroups or for those on high risk medications.
Adverse drug reaction documentation (see Section 3)	**(%pre audit to %post audit)**
Information about a patient's previous ADRs or allergies can assist staff in making decisions about medication therapy and avoid re-prescribing, dispensing and administering a medication involved in a previous ADR.	Recording of reactions and medication names for Adverse Drug Reaction (ADR) documentation: • recording of reactions improved from 21% pre to 50% post; • documentation of medication names improved from 31% pre to 89% post.
Signing of ADR histories by the clinician helps to assign accountability for the information obtained.	ADR histories completed and signed by clinicians improved from 1% pre to 35% post.
Alerts provide a physical reminder to help prevent the re-prescription, administration or dispensing of a medication to which a patient has previously had an ADR.	Use of physical ADR alerts: • use of ADR alert stickers reduced from 52% pre to 32% post; • use of ADR alert bracelets improved from 58% pre to 65% post. Reduction in re-prescription of medications identified as being involved in a previous ADR improved from 9% pre, reducing to 6% post.
Prescribing of regular, once only, PRN and variable dose medications (see Section 4)	**(%pre audit to %post audit)**
The NIMC includes a red "*Tick if Slow Release"* box as a prompt to prescribers to indicate a sustained or modified release form of an oral drug. If not ticked, it is assumed that the standard release form is to be administered.	Form present or clear (SR) improved from 18% pre to 38% post.
The dose of a medication must be clearly and correctly documented by the prescriber. Medication errors can occur when the medication dosage ordered by the prescriber is not correctly interpreted.	The rate of clear and correct doses improved from 93% pre to 96% post.
The frequency and times of medication administration should be specified by the prescriber with the time of administration of the dose . Medication errors can occur when the frequency ordered by the prescriber is not correctly interpreted and administration times do not correspond with frequency prescribed.	Administration times: • times entered by the prescriber improved from 18% pre to 68% post; • times correlating with the frequency improved from 90% pre to 97% post.

INDICATOR AND RATIONALE	NIMC PILOT OUTCOMES
Inclusion of the indication provides a check for both the dose and intention to continue therapy. (for example, the prescription can be reviewed in the context of why it was prescribed for that particular patient, thereby reducing the risk of inadvertent cessation of therapy.)	Documentation of indications for medication orders improved from 6% pre to 20% post.
For an active ingredient of a medication, there may be a number of brands available. Use of the generic name reduces the risk of confusion between trade names that sound alike or look alike. This can lead to drug selection error or misinterpretation and a patient not receiving the medication intended by the prescriber.	Use of generic names of medications when prescribing improved from 68% pre to 74% post,.
Medication orders that have not been clearly ceased by the prescriber may inadvertently continue to be administered .	Orders ceased according to hospital policy improved from 29% pre to 38% post .
Prescribing of PRN (when required) medications (see Section 5)	**(%pre audit to %post audit)**
In order to prevent overdose a maximum dose of PRN medications should be specified for the 24hr period.	Documentation of maximum dose per 24hrs for PRN medications improved from 24% pre to 36% post.
Prescriber identification (see Section 6)	**(%pre audit to %post audit)**
The prescriber should be able to be clearly identified on medication orders to allow nursing, pharmacy or other medical staff to contact them and clarify details about the medication order. (This is also a legal requirement).	Legibility of prescriber's name on medication orders improved from 41% pre to 79% post.
Warfarin dosing and administration (see Section 8) *Note: very small sample sizes and large differences in relevant patient numbers in pre- and post- audit groups limit the ability to meaningfully interpret warfarin results.	**(%pre audit to %post audit)**
Documentation by the prescriber of the indication for Warfarin, INR targets and INR results enables staff to make informed decisions about a patient's Warfarin dose.	Warfarin indication and INR documentation: • The inclusion of the indication for the Warfarin improved from 14% pre to 41% post,; • target INR documentation improved markedly from 9% pre to 71% post.
Because of well documented risks associated with use of warfarin, all patients should receive counselling about the use of warfarin and provided with a warfarin booklet (see Section 8). * Note: performance overall for provision of warfarin information and education for patients was generally poor. This may indicate that a change to hospital policy is required to ensure that patient information and education about warfarin is available.	Warfarin guidelines should be targeted for improvement: • guidelines present decreased from 15% pre to 2 % post; • recording of the provision of patient education decreased from 13% pre to 1% post.

INDICATOR AND RATIONALE	NIMC PILOT OUTCOMES
Medication history documentation and clinical pharmacist review (See Section 9) * Note: performance overall for pharmacist annotation of medication chart and documentation of clinical pharmacist review was generally low.	**(%pre audit to %post audit)**
A patient's medication history prior to admission provides an essential source of information for staff when making decisions about appropriate medication therapy. Documentation of medication history assists with appropriate prescribing during a patient's admission but also facilitates communication back to the GP of changes made to a patient's medications during admission by the attending health professionals.	Documentation of medication history improved from 2% pre to 11% post.
Daily review of the medication chart by a clinical pharmacist helps to ensure that all orders are clear, safe and appropriate for the individual patient, therefore minimising the risk of an adverse medication event.	Number of days on which a clinical pharmacist reviewed the medication chart improved from 5% pre to 14% post.
Review of individual medications by a clinical pharmacist helps to ensure that all orders are clear, safe and appropriate for the individual patient, therefore minimising the risk of an adverse medication event.	Pharmacist annotation and clinical pharmacist review improved from 29% pre to 40% post, with room for further improvement.

Recommendations

In accordance with the recommendation from Australian Health Ministers, the NIMC should be implemented by June 2006 in all public hospitals. The current pilot shows that implementation is feasible and results in improvements in patient care and quality of service.

Implementation of the NIMC is a continuous quality improvement process designed to assist in improving medication safety in Australian hospitals. Lessons learned from the pilot project suggest that successful implementation of the NIMC should include:

- Comprehensive project planning eg. using the project planning template provided by the Council to participating NIMC pilot sites;
- Nomination of a project team for implementation, including the three main staff groups (doctors, nurses and pharmacists), and representatives from both Executive level and the 'coal-face';
- Local launch of the NIMC in such a way as to avoid implementation in the pre-Christmas and January periods when many staff are on leave;
- Incorporating the NIMC into staff education / medication risk awareness training;
- A 'champion' for the NIMC to be located in each main unit / clinical area, and where possible, supportive pharmacists to participate in ward rounds; and
- Pre and post implementation audits as part of ongoing monitoring and quality improvement processes.

Healthcare institutions should have ongoing evaluation and monitoring processes in place to evaluate the impact of implementation of the NIMC in the context of their own settings and to assist in identifying areas of medication safety to be targeted for further improvement. The NIMC is an enabler for a bigger change management process involving risk awareness to improve the safety and quality of prescribing, dispensing and administration of medication in hospitals.

NIMC Pilot Aggregate Data Report

Contents of the NIMC Pilot Aggregate Data Report

*Not all pilot sites audited this component or had patients undergoing medication in this area.

Background to the NIMC Pilot Audit Processes and Data

The NIMC Pilot Aggregate Data Report provides a comparison to the baseline results following the implementation of the NIMC and to the averages calculated from both pre and post-implementation audits. Pre and post-implementation audit averages were calculated using the average for each data point calculated from 28 NIMC pilot sites. It is important to note that the baselines for each hospital were different due to the varying designs of medication charts utilised prior to implementation of the NIMC. Additionally, there may be some inter-interpreter variability between sites in terms of the use of the NIMC pilot audit tool. Consequently, the results should be interpreted with some caution; however the trend of the data demonstrates improvement in medication documentation processes across sites participating in the NIMC pilot.

Objectives of the NIMC pilot aggregate data report

- To inform national implementation of the NIMC across Australia.
- To show the national averages calculated from the pre and post-implementation data provided by NIMC pilot sites.
- To examine data from sites participating in the NIMC pilot to show where all improvements have been made and where further improvements could be targeted eg. through staff education.

Objectives of the pre and post-implementation audits

Pre-implementation audit objectives

- To identify areas of medication chart documentation, including prescribing, supply and administration that could be improved to enhance patient safety and improve medication management.
- To establish a base-line for comparison of medication error rates post implementation of the NIMC and associated interventions.

Post-implementation audit objectives

- To evaluate the impact of the medication chart and the implementation process on the safety and quality of prescribing and medication documentation.
- To identify areas of medication chart documentation that could further enhance patient safety and improve medication management, as part of a process of continuous quality improvement.

Explanatory notes on the presentation of data in this report

- Pre-imp: the pre-implementation audit data submitted by 28 sites.
- Post-imp: the post-implementation audit data submitted by 28 sites.

- Pre and post averages: the average for that data point calculated from 28 NIMC pilot sites submitted data and divided by 28.
- It should be noted that averages for the following data points have been calculated differently:
    - Warfarin (pre average – 24 sites, post average – 25 sites)
    - IV Sub-cut orders (pre average – 19 sites, post average – 14 sites).
- Comparing percentages charts: some charts compare the change in the calculated percentages between pre and post. For example, if a data point showed only 10% success rate in the pre-implementation audit, but a 20% success rate in post-implementation audit then a 100% increase in success rate is reported. The reason the percentages are used to compare, rather than the values, is that the number of patients/medication charts audited pre-implementation and post-implementation differ greatly and would not reflect a true picture of performance.
- The pre-implementation audit data was not perhaps as thorough as had been anticipated. This may have been due to the variety of medication documentation previously used in participating hospitals which may have presented difficulties in identifying appropriate fields for using the NIMC audit tool.
- Comments at the end of each section are not intended to be a comprehensive discussion on the data, but to simply highlight important changes or level of performance that should be noted.

Method for the NIMC pilot pre and post-implementation audits

An observational review of patient's medication charts was undertaken across 28 sites around Australia, including public and private facilities across metropolitan, regional and rural/remote areas. The observers used a standard data collection form 'Medication Chart Documentation Audit Tool'.[1]

Criteria for the audit were derived from an extensive literature review undertaken by the Queensland Health Adverse Drug Event Prevention Project team in 2003. The majority of the criteria come from studies by Bates *et al*[2] [3] [4], and were chosen for their ability to evaluate:

- the compliance of each site with the relevant policy for completion of a medication chart; and
- the frequency of omissions, errors or ambiguities that may potentially lead to a medication incident and or an adverse medication event.

The local policy for completion of a medication chart was used as the reference tool in the pre-implementation audit, and the NIMC Guidelines were used as the reference tool in the post-implementation audit.

Ten aspects of the medication chart documentation were examined in pre and post-implementation audits. These form the basis for the ten sections of the NIMC pilot aggregate data report that follow (pages 7 to 22).

Sections 2 to 10 of the NIMC Pilot Aggregate Data Report identify risk and criteria at the beginning of each section. 'Risk' outlines the risk to patient safety if this section is incomplete, and 'Criteria' gives a short explanation as to the criteria used to assess the components of this section of the NIMC pilot audit tool.

Final data collation and analysis was undertaken by Kathryn Bollen and Rod Hurley, Project Officers for the Office of the Safety and Quality Council. For any queries regarding this report,

[1] The "Medication Chart Documentation Audit Tool" was provided to participating sites on the Council's NIMC Pilot CD-ROM.

[2] Bates DW, Leape LL, Berwick DM. "What Practices will Most Improve Safety? Evidence Based Medicine Meets Patient Safety". JAMA 2002, July 24/31, Vol 288, No. 4: 501 - 507

[3] Bates DW, Cullen DJ, Laird N et al. "Incidence of adverse drug events and potential adverse drug events: Implications for prevention". JAMA 1995; 274:29-34

[4] Leape LL, Bates DW, Cullen DJ et al. "Systems analysis of adverse drug events". JAMA 1995; 274:35-43

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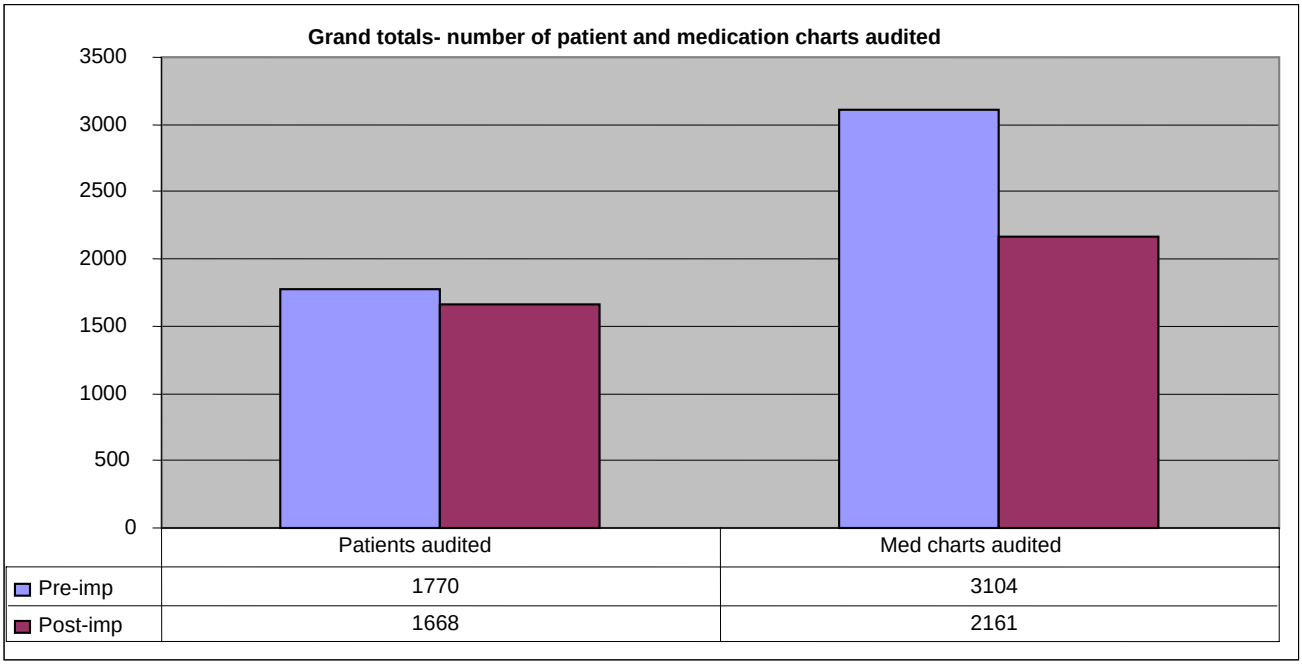
NIMC pilot – total number of patients and medication charts audited

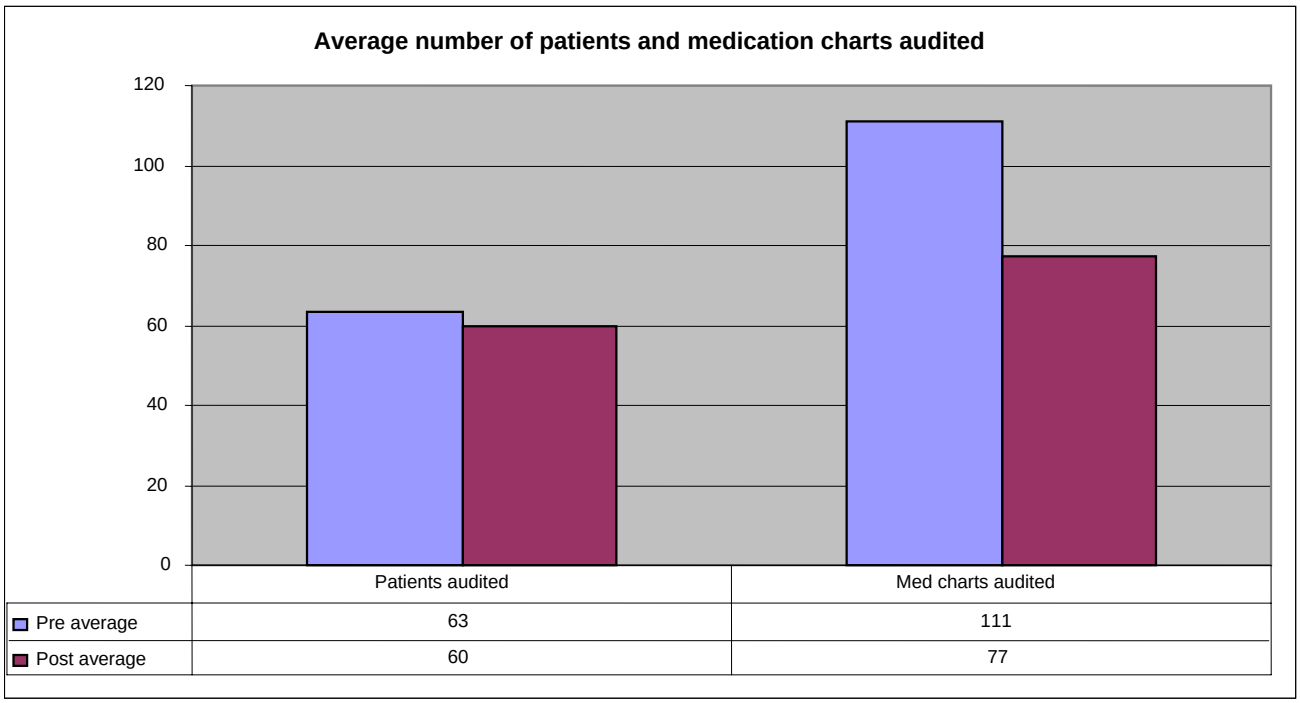
The NIMC pilot aggregate data report has collated pre and post-implementation audit data from 28 sites. The total number of patients and medication charts audited are presented in the graphs below.

Fig 1:



	Patients audited	Med charts audited
Pre-imp	1770	3104
Post-imp	1668	2161

Fig 2:

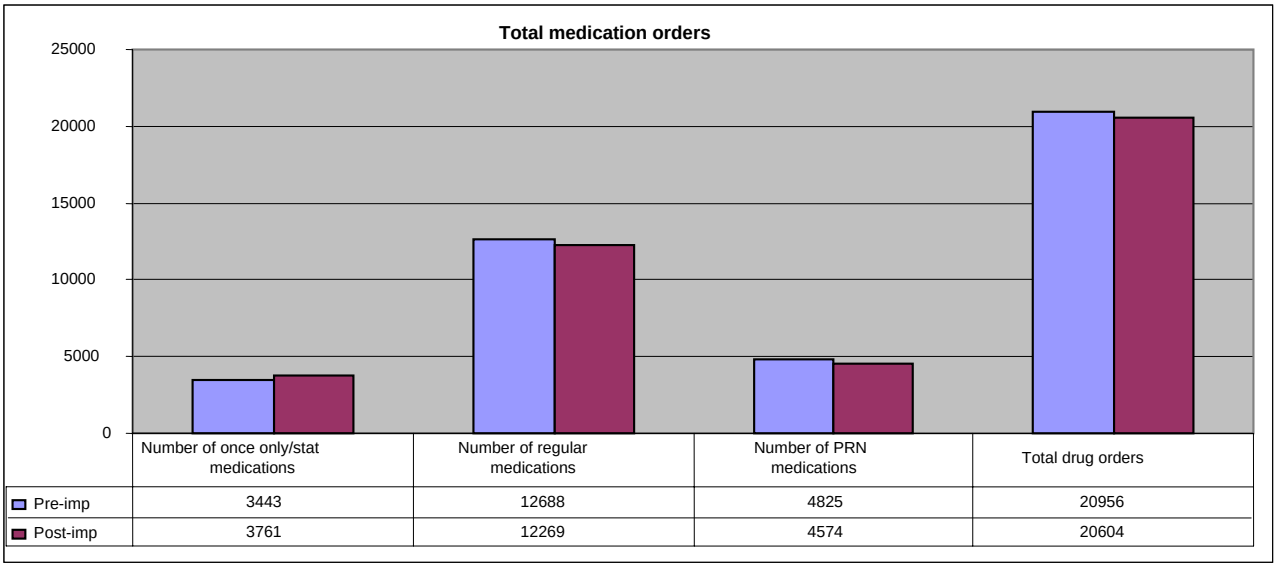


	Patients audited	Med charts audited
Pre average	63	111
Post average	60	77

Section 1: Frequency of types of medication orders

The pre and post-implementation audits reviewed all medication orders available at the end of the patients' beds, including current orders as well as those that had been cancelled. Figures 3 and 4 (below) display a comparison between the total number of medication orders from each of the three main sections of the NIMC (once only/stat, regular and PRN medications) as well as the total number of drug orders from the pre and post-implementation audits.

Fig 3:



	Number of once only/stat medications	Number of regular medications	Number of PRN medications	Total drug orders
Pre-imp	3443	12688	4825	20956
Post-imp	3761	12269	4574	20604

Fig 4:

	Number of once only/stat medications	Number of regular medications	Number of PRN medications	Total drug orders
Pre-imp average	123	453	172	748
Post-imp average	134	438	163	736

Types of medication orders calculated in the audits included stat, telephone, once only, variable dose, regular, as required (PRN) medications and intravenous (IV) / sub-cutaneous medication orders.

The audit excluded the following types of medication orders:

- Previous medication charts that had been filed in patient medical records
- Acute and chronic pain ordering charts
- Blood Glucose Level (BGL) and insulin ordering charts.

Section 2: Completion of patient identification and weight

RISK: Where patient identifiers are incomplete and where patient identification is not visible on all sections of the chart, there is a risk of medication being administered to the wrong patient. A number of high-risk medications require dosing per kg of bodyweight and a majority of paediatric doses are based on bodyweight and surface area. Where a patient's weight is not readily available inaccurate dosing of medications may result.

CRITERIA: The NIMC requires two identification labels, one to be affixed to page 3 (visible on page 1, 2 and 3) and one on page 4 of the chart. For the purpose of the audit, patient identifiers were considered as incomplete when there are less than two patient identification labels on each chart. The NIMC also requires the first prescriber to handwrite the first name and surname of the patient underneath the identification area – UNLESS a patient ID label has not been used and UR number, name and date of birth have been handwritten. Patient bodyweight should be documented on the medication chart.

Figures 5, 6 and 7 display a comparison between pre and post-implementation audits of:

- the total number of medication chart pages with patient identification
- ID labels with the patient's name documented below the label and;
- those with patient's weight recorded.

Fig 5:

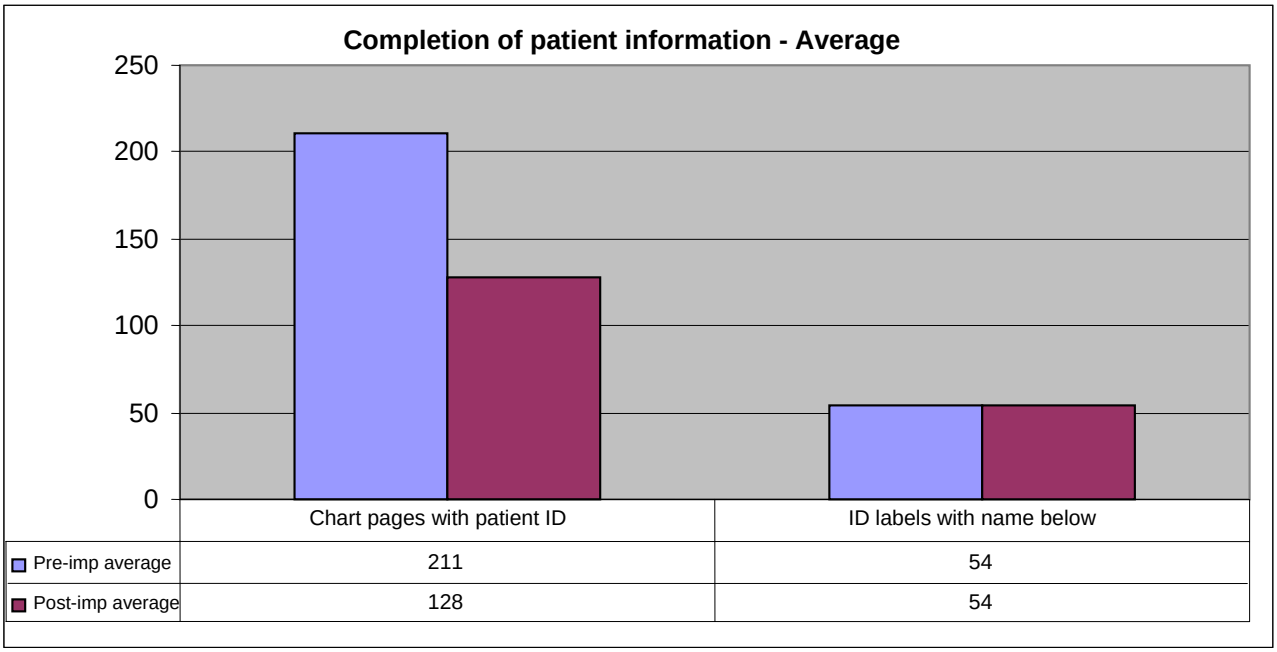


Fig 6:

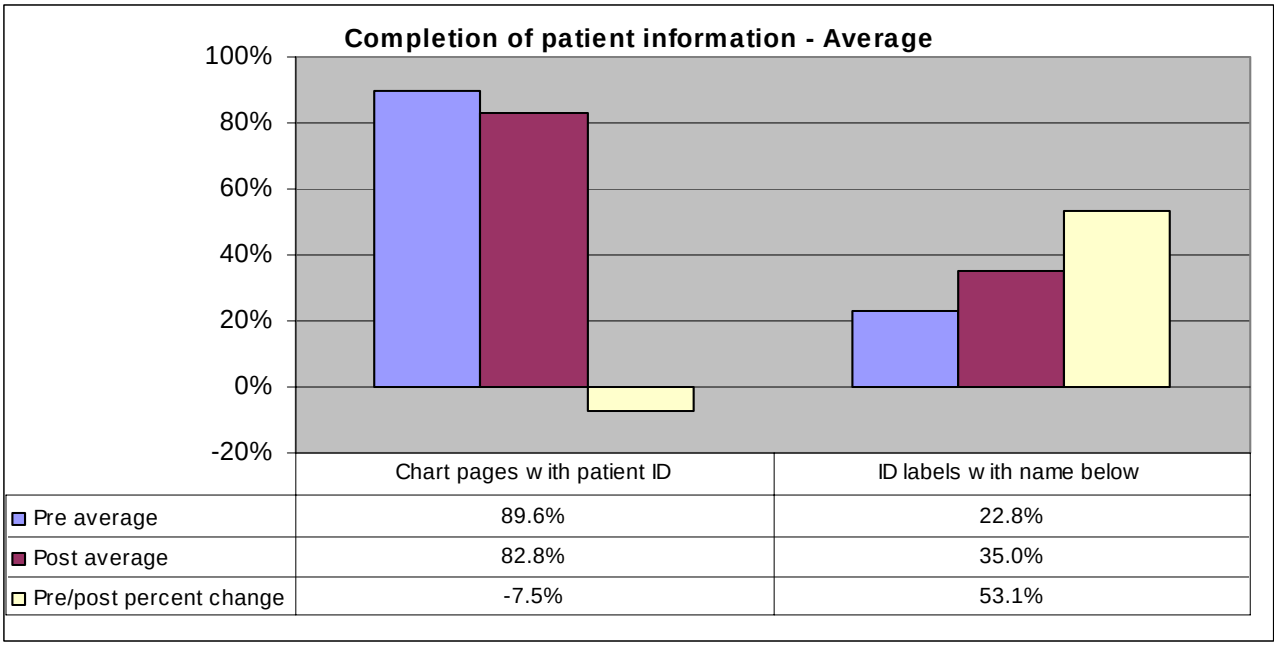
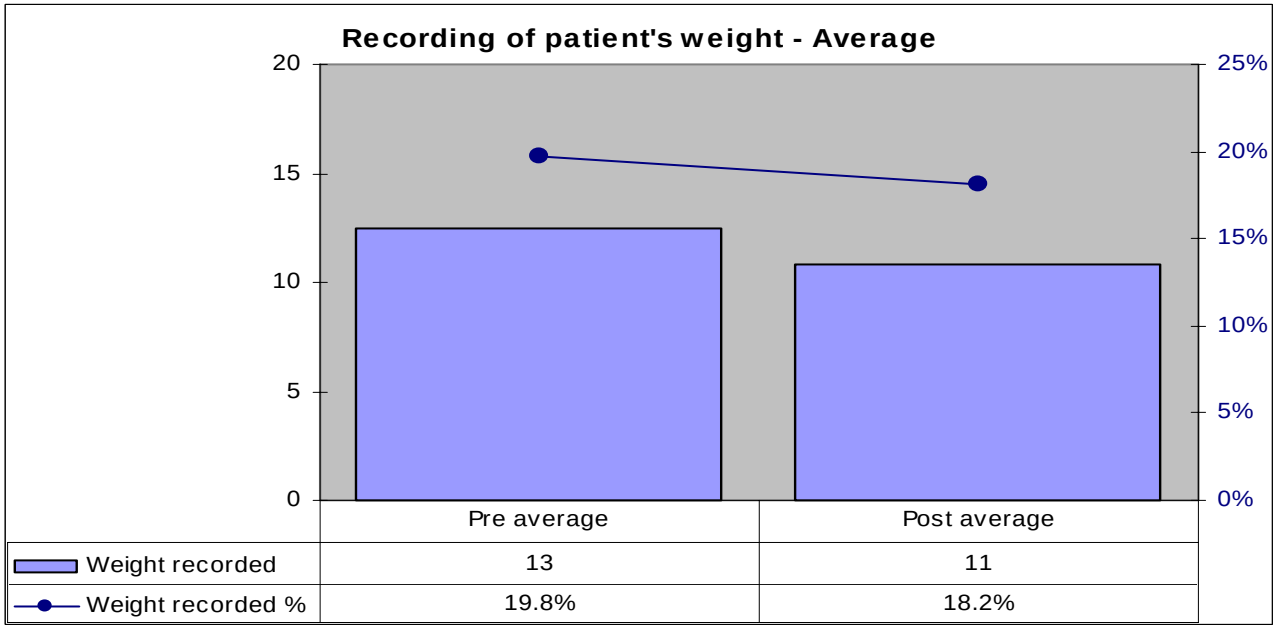


	Chart pages w ith patient ID	ID labels w ith name below
Pre average	89.6%	22.8%
Post average	82.8%	35.0%
Pre/post percent change	-7.5%	53.1%

Fig 7:



	Pre average	Post average
Weight recorded	13	11
Weight recorded %	19.8%	18.2%

Comments on patient identification and weight

- Anecdotal information suggests that participating sites used different methods in reporting the number of chart pages requiring ID labels. All responses were calculated in accordance with 2 ID labels required per charts, however anecdotal evidence suggests that some sites have varying requirements for labels, and some had numerous charts where medication orders could be documented. Information on these requirements was not always reported in individual site audit data. Consequently, all data has been calculated in the same way to give an even playing field in presenting averages for pre-implementation data.
- There was minimal change in the documentation of patient weight, however the results were generally low and this could be an area targeted for improvement. Recording of patient weight on the NIMC was generally poor, with some sites not recording any data for this field. Recording of patient weight was not previously a common feature on many medication charts. Changes to the NIMC artwork following the NIMC pilot process should improve the visual layout of this field and will assist in improving documentation of patient weight to help ensure patient safety in medication dosage calculations.

Section 3: Adverse Drug Reaction (ADR) documentation and use of alerts

RISK: Incomplete ADR recording and lack of clear alerts could result in patient harm by re-exposing the patient to a drug to which a previous ADR has occurred.

CRITERIA: At the time of admission all patients should have either (1) an ADR documented or (2) "Nil known" ticked by the admitting medical staff. Each ADR should be documented as:

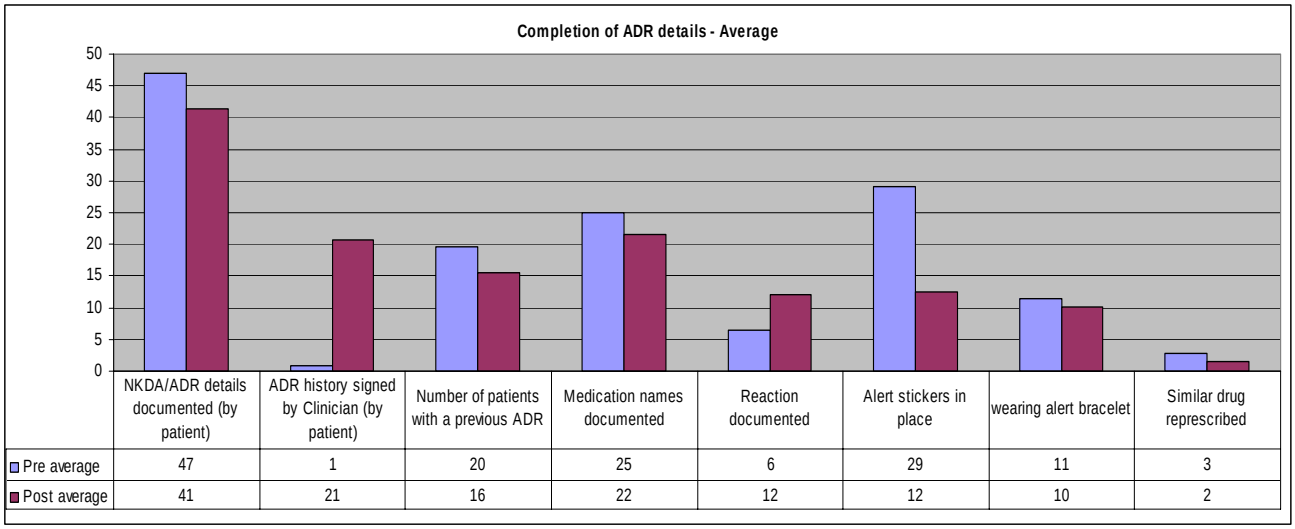
- the drug
- the reaction and
- date the reaction occurred

(For more information on ADR documentation see NIMC Guidelines section 3.4).

For patients with an ADR, alerts should be used in the form of ADR alert stickers on the medication chart and ADR bracelets for the patient in accordance with the NIMC Guidelines (section 3.4).

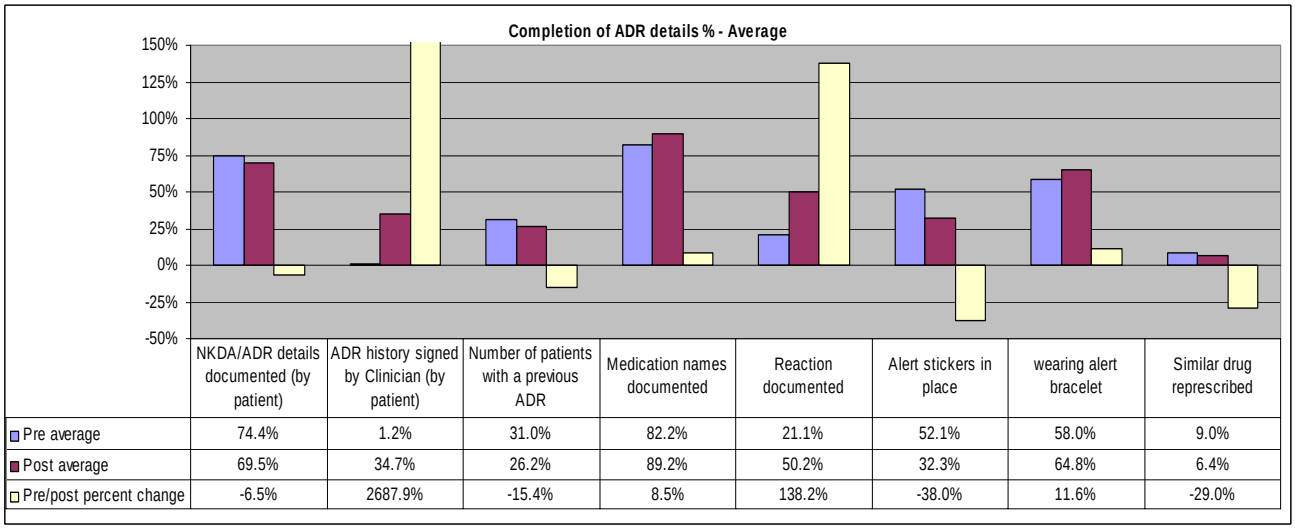
Medication charts were reviewed for any documentation of a previous ADR or allergy and where available, patients were asked about the presence of any previous ADR or allergy. Where patients were not available, the auditors reviewed the patient's medical record. Figures 8 and 9 display a comparison between the completion of ADR documentation from pre and post-implementation audit data in both average number (Fig.8) and percentage (Fig.9).

Fig 8:



	NKDA/ADR details documented (by patient)	ADR history signed by Clinician (by patient)	Number of patients with a previous ADR	Medication names documented	Reaction documented	Alert stickers in place	wearing alert bracelet	Similar drug represcribed
Pre average	47	1	20	25	6	29	11	3
Post average	41	21	16	22	12	12	10	2

Fig 9:



	NKDA/ADR details documented (by patient)	ADR history signed by Clinician (by patient)	Number of patients with a previous ADR	Medication names documented	Reaction documented	Alert stickers in place	wearing alert bracelet	Similar drug represcribed
Pre average	74.4%	1.2%	31.0%	82.2%	21.1%	52.1%	58.0%	9.0%
Post average	69.5%	34.7%	26.2%	89.2%	50.2%	32.3%	64.8%	6.4%
Pre/post percent change	-6.5%	2687.9%	-15.4%	8.5%	138.2%	-38.0%	11.6%	-29.0%

Comments on ADR documentation and use of alerts

- Improvement was achieved in the number of ADR histories signed by a clinician (from 1.2% to 34.7%) between the pre and post-implementation audit.
- Results for the use of ADR alert stickers and bracelets suggest that these tools may not have been available at all sites. ADR alert stickers and bracelets are a physical reminder recommended for patient safety to help prevent the re-prescription, administration or dispensing of a medication to which a patient has previously had an ADR.
- Documentation of medication names and reactions improved overall between pre and post-implementation audit, with room for further improvement to improve patient safety.
- A reduction was achieved in the re-prescription of medications identified as being involved in previous ADRs (from an average of 9% to 6.4%), however this area could be targeted for further improvement to improve patient safety.

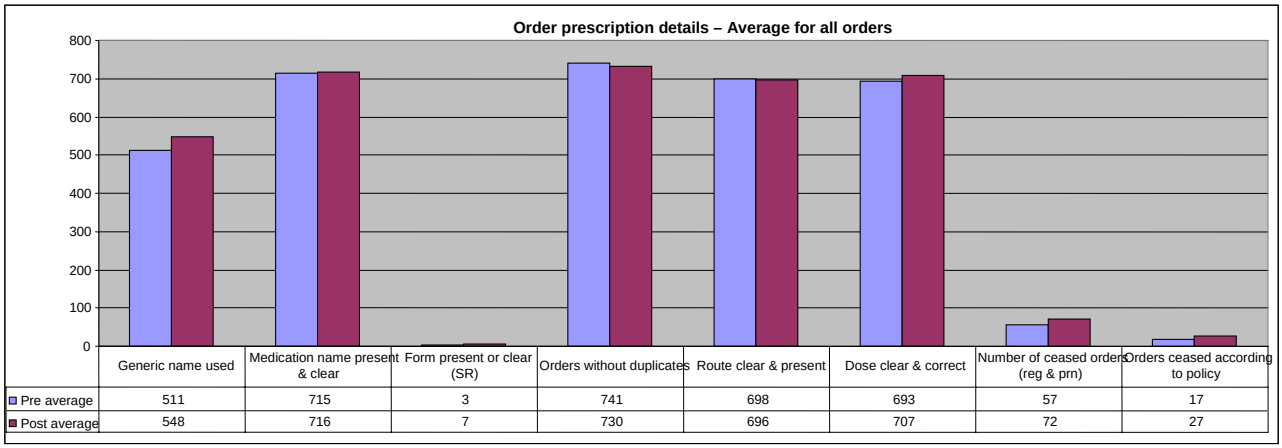
Section 4: Prescribing of regular, once only, PRN and variable medications

RISK: Unclear documentation of a drug name, the form of a drug (i.e. Sustained Release-SR), the route, dose, and frequency or administration time represents a significant risk for an administration error.

CRITERIA: All prescribing fields are to be clearly and correctly completed according to the NIMC Audit Guidelines.

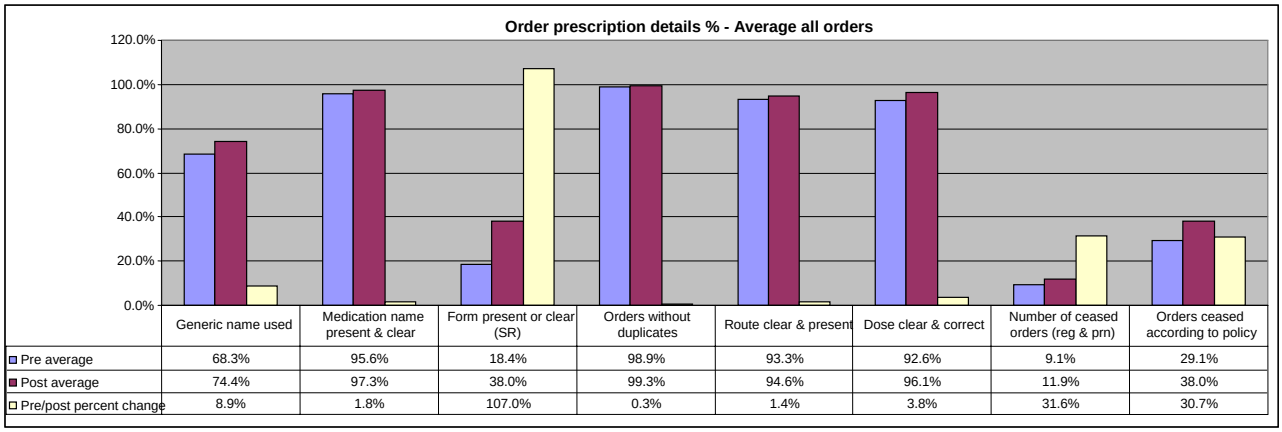
Figures 10 and 11 display a comparison between the prescribing documentation of all orders on medication charts pre and post-implementation in both the average number (Fig.10) and percentage (Fig.11).

Fig 10



	Generic name used	Medication name present & clear	Form present or clear (SR)	Orders without duplicates	Route clear & present	Dose clear & correct	Number of ceased orders (reg & prn)	Orders ceased according to policy
Pre average	511	715	3	741	698	693	57	17
Post average	548	716	7	730	696	707	72	27

Fig 11



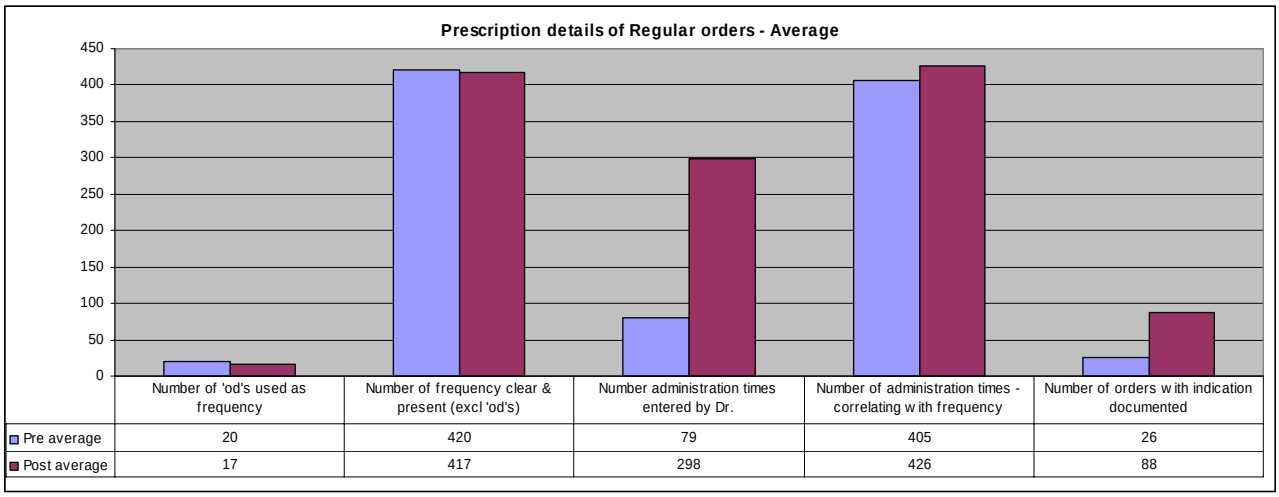
	Generic name used	Medication name present & clear	Form present or clear (SR)	Orders without duplicates	Route clear & present	Dose clear & correct	Number of ceased orders (reg & prn)	Orders ceased according to policy
Pre average	68.3%	95.6%	18.4%	98.9%	93.3%	92.6%	9.1%	29.1%
Post average	74.4%	97.3%	38.0%	99.3%	94.6%	96.1%	11.9%	38.0%
Pre/post percent change	8.9%	1.8%	107.0%	0.3%	1.4%	3.8%	31.6%	30.7%

Comments on prescribing – all orders

- Overall prescribing documentation generally improved, however there is scope for improvement in legibility of medication orders.
- Improvement was demonstrated in documentation of medication form, whether the form was present or clear (SR - slow release medications, from 18.4% to 38%).
- Use of generic names when prescribing medications improved (from 68.3% to 74.4%), with room for further improvement.
- Documentation of clear and correct dosage improved from (92.6% to 96.1%).

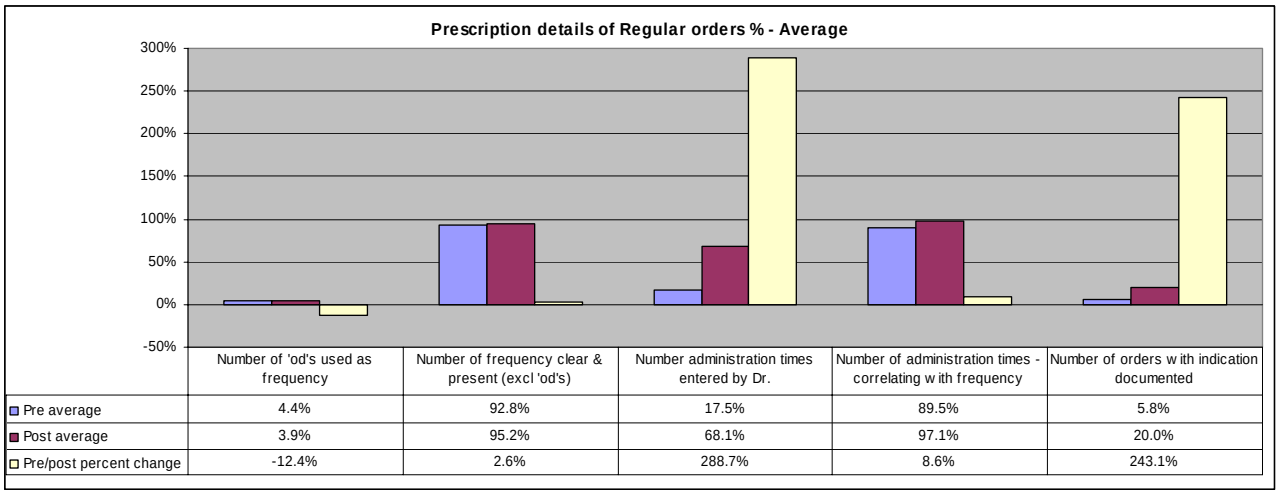
Figures 12 and 13 display the comparison between pre and post-implementation audits of regular medication orders (average numbers and percentages).

Fig 12



	Number of 'od's used as frequency	Number of frequency clear & present (excl 'od's)	Number administration times entered by Dr.	Number of administration times - correlating w ith frequency	Number of orders w ith indication documented
Pre average	20	420	79	405	26
Post average	17	417	298	426	88

Fig 13



	Number of 'od's used as frequency	Number of frequency clear & present (excl 'od's)	Number administration times entered by Dr.	Number of administration times - correlating w ith frequency	Number of orders w ith indication documented
Pre average	4.4%	92.8%	17.5%	89.5%	5.8%
Post average	3.9%	95.2%	68.1%	97.1%	20.0%
Pre/post percent change	-12.4%	2.6%	288.7%	8.6%	243.1%

Comments on prescribing of regular medications

- A reduction was achieved in the use of “OD” (for ‘once daily’) as an abbreviation for medication frequency (from 4.4% to 3.9%). The use of “OD” is not considered to be a safe abbreviation as it can be easily confused with other terms.
- Administration times entered by the prescriber demonstrated improvement (from 17.5% to 68.1%), with room for further improvement. In many healthcare institutions, nurses have been responsible for entering administration times. The entering of administration times by the prescriber ensures a checking mechanism against the documented frequency in the medication order. The increase in correlation between administration times and frequency (from 89.5% to 97.1%) suggests that the checking mechanism is contributing to improvement.
- Whilst documentation of the indication of a medication was not previously a common feature of medication charts, documentation improved from 5.8% to 20%. This is a useful patient safety feature as it allows a prescription to be reviewed in the context of why the medication was prescribed for that particular patient, thereby assisting pharmaceutical review and reducing the risk of inadvertent cessation of therapy. Additionally, documenting indication helps to avoid administration of different drugs for the same indication.

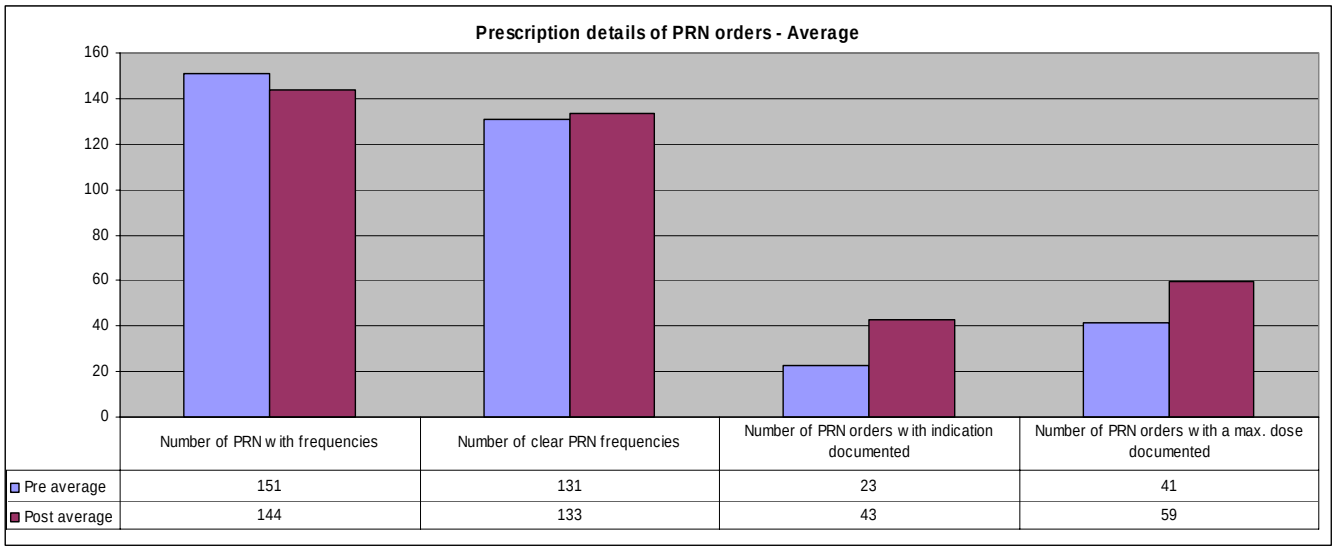
Section 5: Prescribing errors specific to PRN (as required) medication orders

RISK: PRN orders are intended to enable nurses to administer medications when required by patients to manage specific clinical states (e.g. pain relief, nausea and vomiting). Doses or frequencies that are not specified (i.e. morphine 2.5mg PRN) or are inflexible (i.e. Oxycodone 5mg QID PRN) may lead to sub-optimal symptom control or adverse drug events.

CRITERIA: It is intended that medication be ordered in a clear dose range where appropriate (i.e. metoclopramide 10- 20mg), in an hourly frequency (i.e. 3 - 4 hourly), the indication and a maximum dose in a 24 hour period for each medication should be specified.

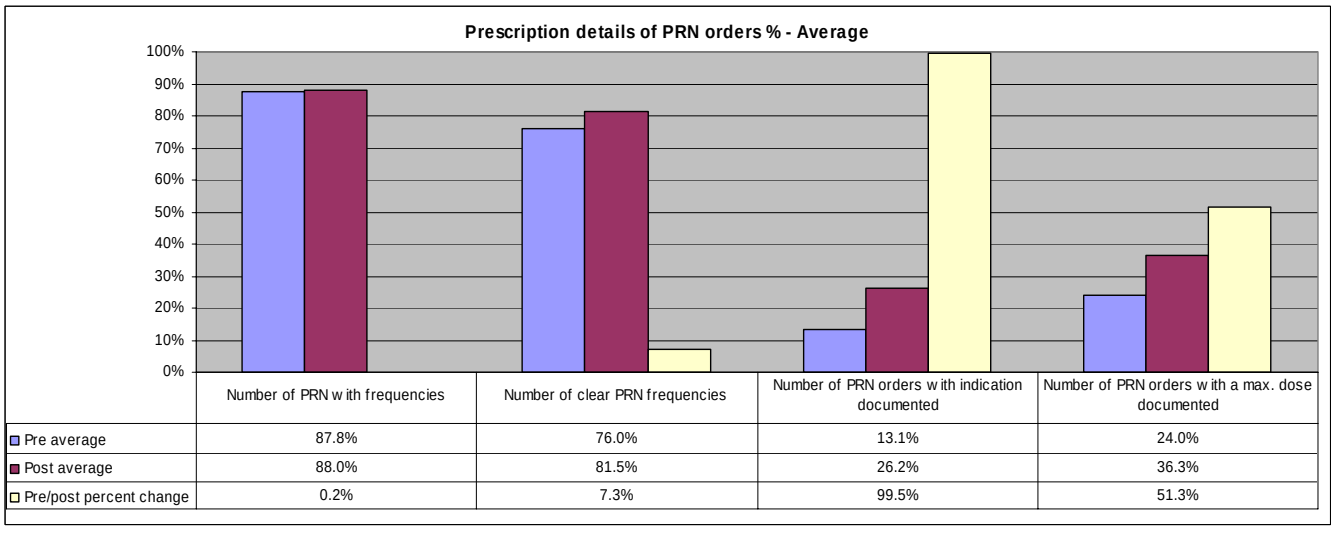
Figures 14 and 15 display a comparison between the PRN medication orders pre and post-implementation audit results in both average number (Fig.14) and percentage (Fig.15).

Fig 14



	Number of PRN with frequencies	Number of clear PRN frequencies	Number of PRN orders with indication documented	Number of PRN orders with a max. dose documented
Pre average	151	131	23	41
Post average	144	133	43	59

Fig 15



	Number of PRN with frequencies	Number of clear PRN frequencies	Number of PRN orders with indication documented	Number of PRN orders with a max. dose documented
Pre average	87.8%	76.0%	13.1%	24.0%
Post average	88.0%	81.5%	26.2%	36.3%
Pre/post percent change	0.2%	7.3%	99.5%	51.3%

Comments on PRN documentation

- Whilst improvement was made across PRN prescribing documentation, further improvement could be made, particularly in relation to indication documentation and recording of maximum dose / 24hrs. These results suggest that recording of indication and maximum dose were not common features in medication charts audited at the pre-implementation stage. Further education regarding the importance of documenting maximum dose and indication would enhance patient safety.

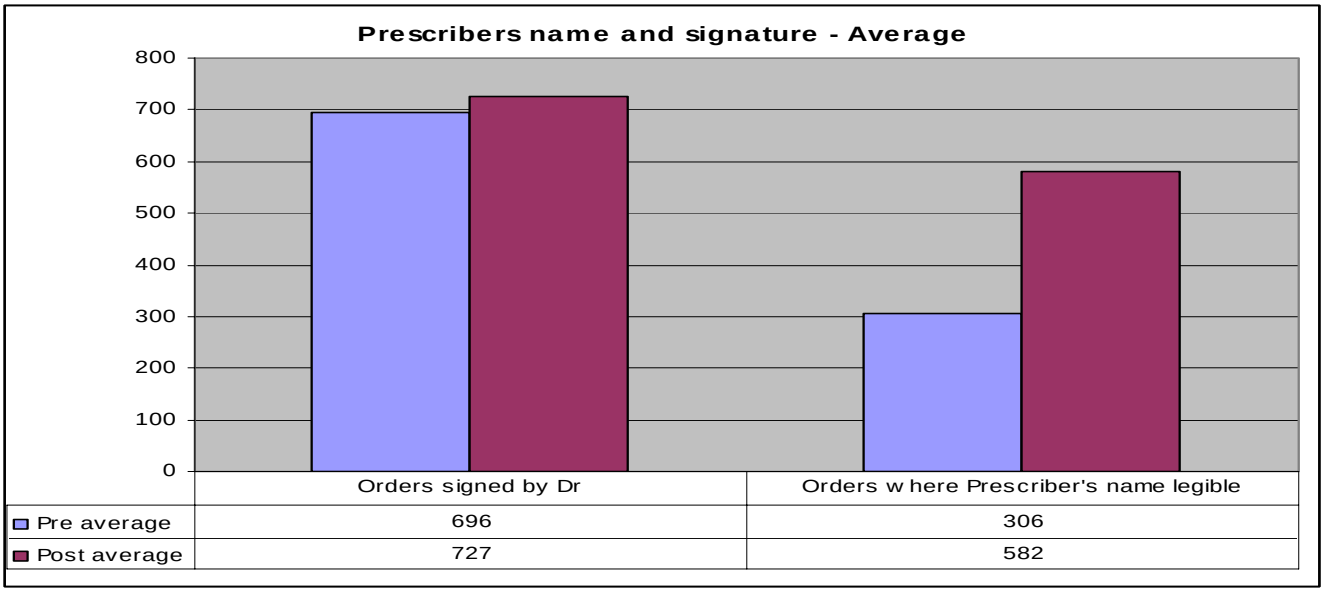
Section 6: Prescriber signature or name unclear

RISK: Difficulty in identifying the prescriber by the printed name or signature on an order can result in risk of any queries about the order not being able to be followed up. Omission of the prescriber's signature indicates unauthorised drug prescribing.

CRITERIA: The prescribers name should be clearly written and identifiable. An authorised prescriber must sign for all drug orders.

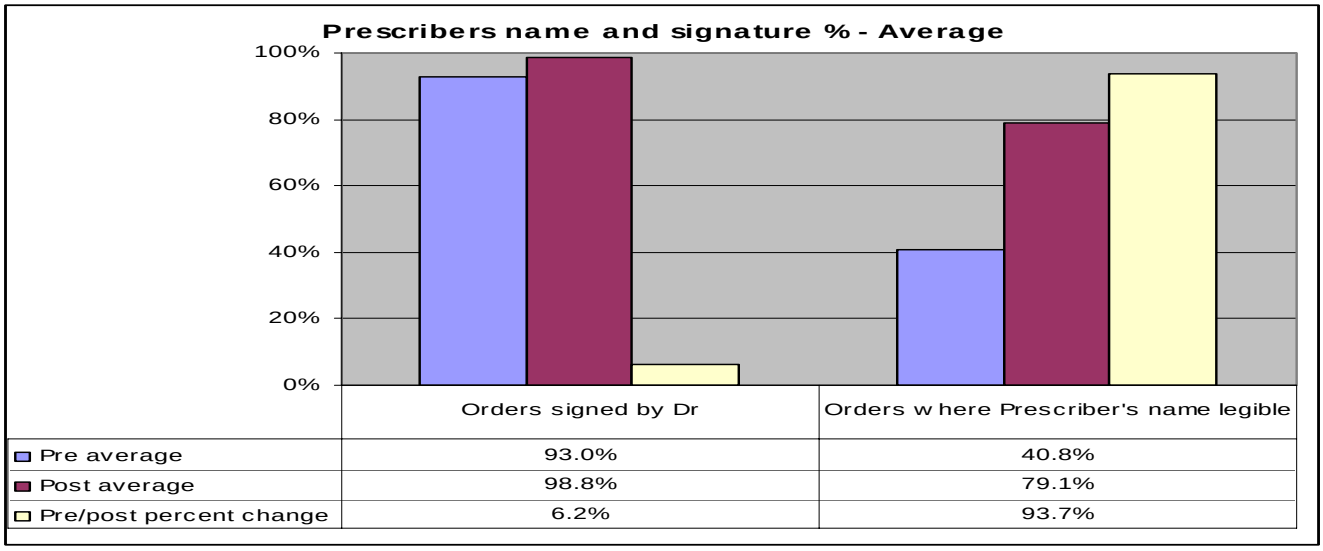
All orders were reviewed and a decision was made by the auditors as to whether a prescriber's name was legible for all signed orders. Figures 16 and 17 display a comparison between signing of orders in pre and post-implementation audits in both average number (Fig.16) and percentage (Fig.17).

Fig 16



	Orders signed by Dr	Orders w here Prescriber's name legible
Pre average	696	306
Post average	727	582

Fig 17



	Orders signed by Dr	Orders w here Prescriber's name legible
Pre average	93.0%	40.8%
Post average	98.8%	79.1%
Pre/post percent change	6.2%	93.7%

Comments

- Improvement was demonstrated in the legibility of the prescriber's name between the pre and post-implementation audits (from 40.8% to 79.1%). Improvement was also demonstrated in the number of orders signed by the prescriber (from 93% to 98.8%, reaching close to 100% of orders signed by the prescriber).

Section 7: Dosage and administration documentation errors

RISK: Inadequate documentation of drug administration or omission of a code indicating reason for non-administration may result in drugs being administered twice or omitted.

CRITERIA : Medication doses that were either:

- not signed for when administered, or
- did not include a clear code to describe why the drug was not administered,

are considered to be an "omission of nursing administration information".

Figure 18 displays a comparison between documentation of administration in pre and post-implementation audit data. Figure 19 displays a comparison between omissions of administration pre and post-implementation, in average omissions per patient and the number of omissions per 1000 orders. Calculating the number of omissions per 1000 orders is common throughout literature on dosage omission studies.

Fig 18:

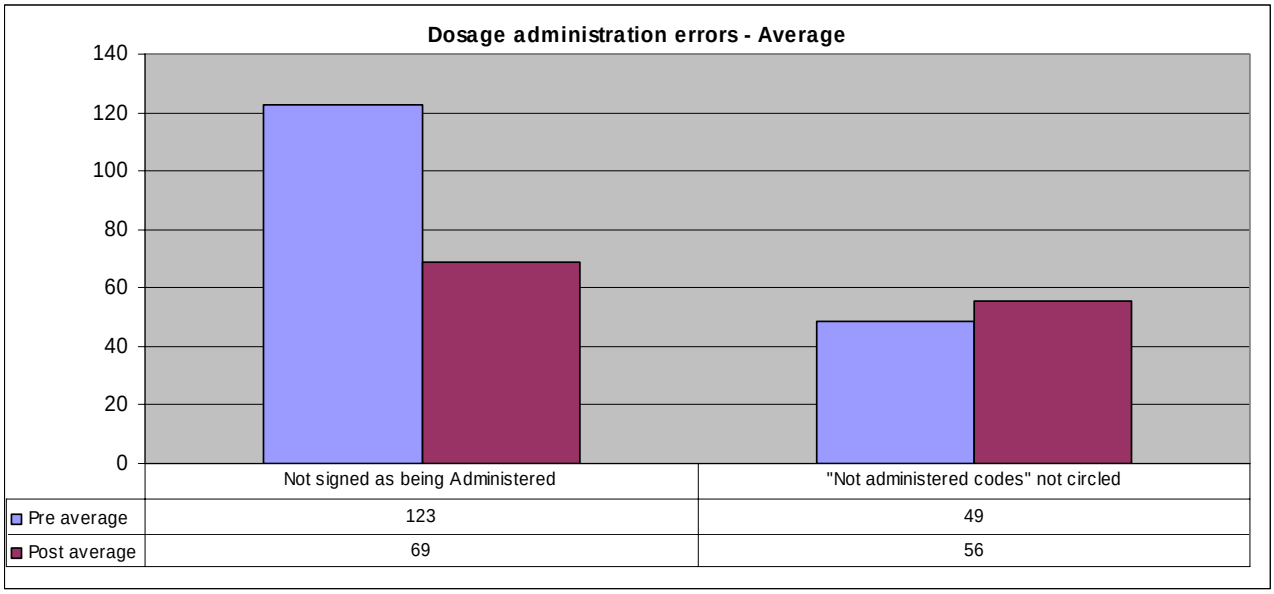


Fig 19:

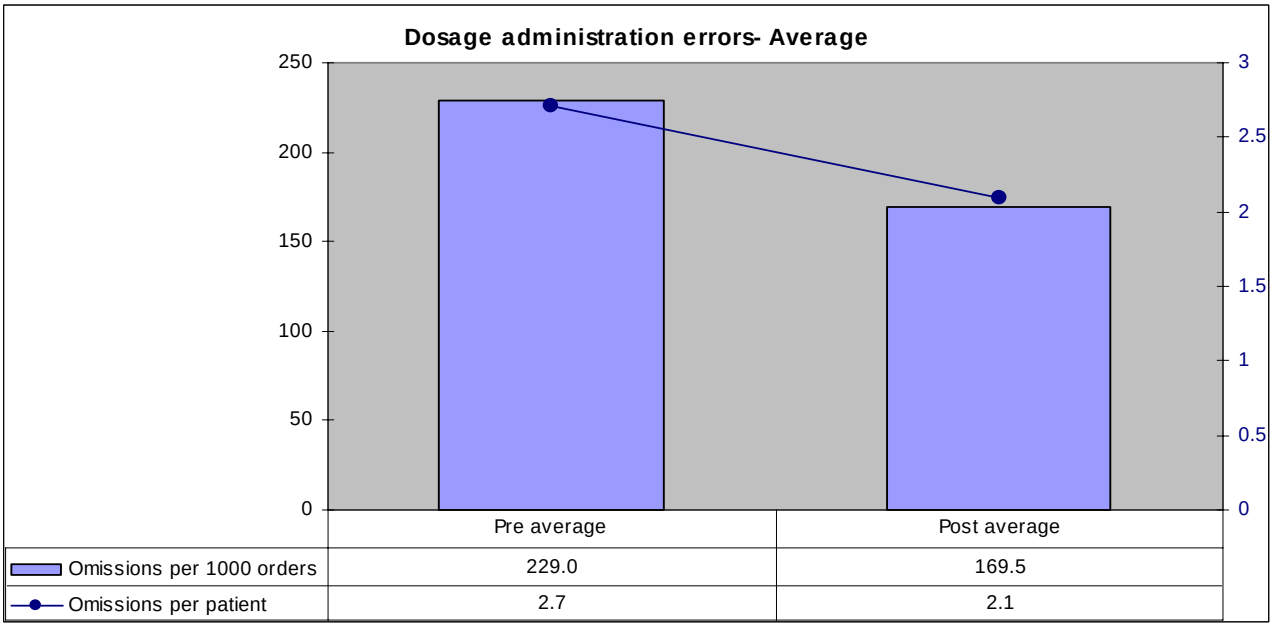
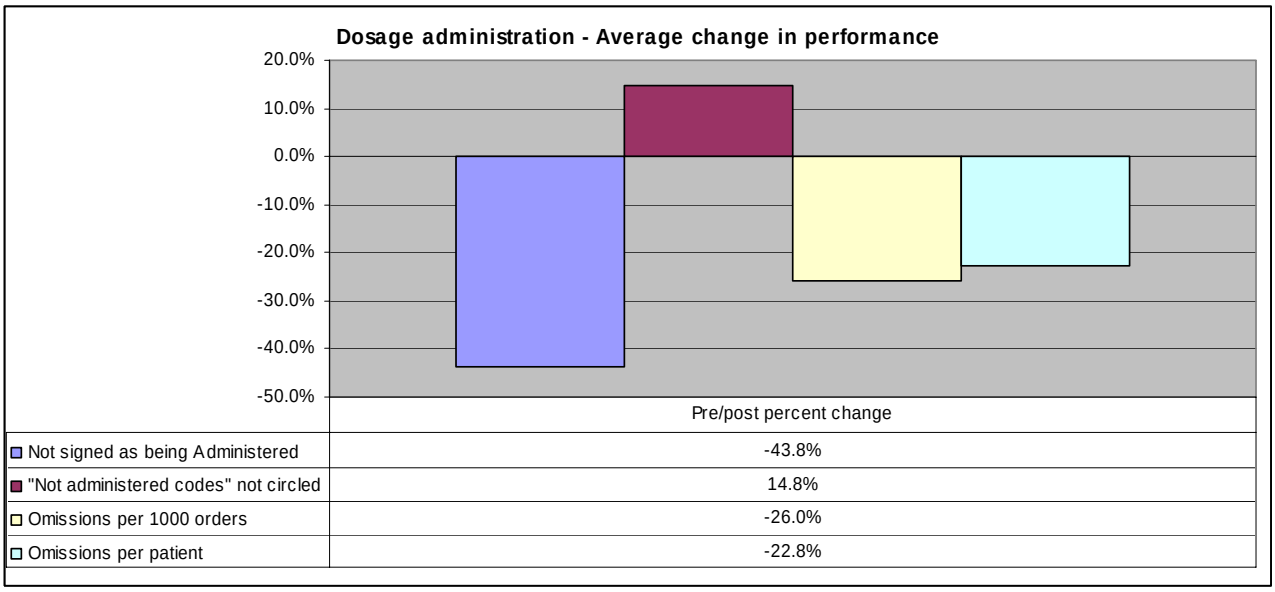


Figure 20 displays the average change in performance between the pre and post-implementation audits for dosage administration errors.

Fig 20:



	Pre/post percent change
Not signed as being Administered	-43.8%
"Not administered codes" not circled	14.8%
Omissions per 1000 orders	-26.0%
Omissions per patient	-22.8%

Comments on dosage administration errors

- The general trend in results between pre and post-implementation audit data from the NIMC pilot is a reduced rate of omissions of administration overall. Education could target further improvement in this area.
- Improvement could be made in circling ‘not administered’ codes when medications are not administered. Circling of these codes helps to prevent them from being confused with other documentation on the chart, such as administration signatures.

Section 8: Warfarin dosing and administration

RISK: Excessive or inadequate anticoagulation with warfarin is associated with risks of bleeding or thromboembolic events. Evidence suggests that risks are reduced by providing relevant decision support such as:

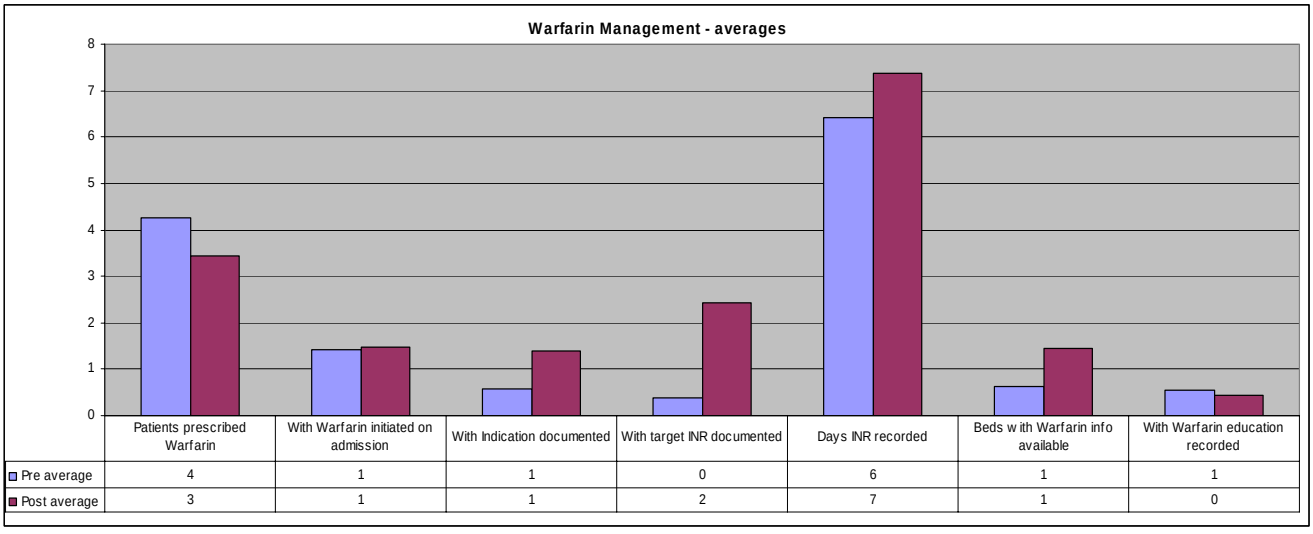
- dosing & interaction guidelines,
- indication for Warfarin
- target range for INRs
- previous INR results.

Lack of patient education may lead to poor adherence to medication therapy post discharge.

CRITERIA: For patients starting warfarin therapy, daily INRs should be obtained until the patient has been therapeutic for at least 2 days. Inpatients who were taking warfarin prior to admission require an INR to be taken when changes to their regular medication and/or physiological parameters occur**.** All adult patients' medication folders should ideally include a copy of the warfarin guidelines. A patient should be provided with education regarding warfarin usage by a doctor, nurse or pharmacist during their stay.

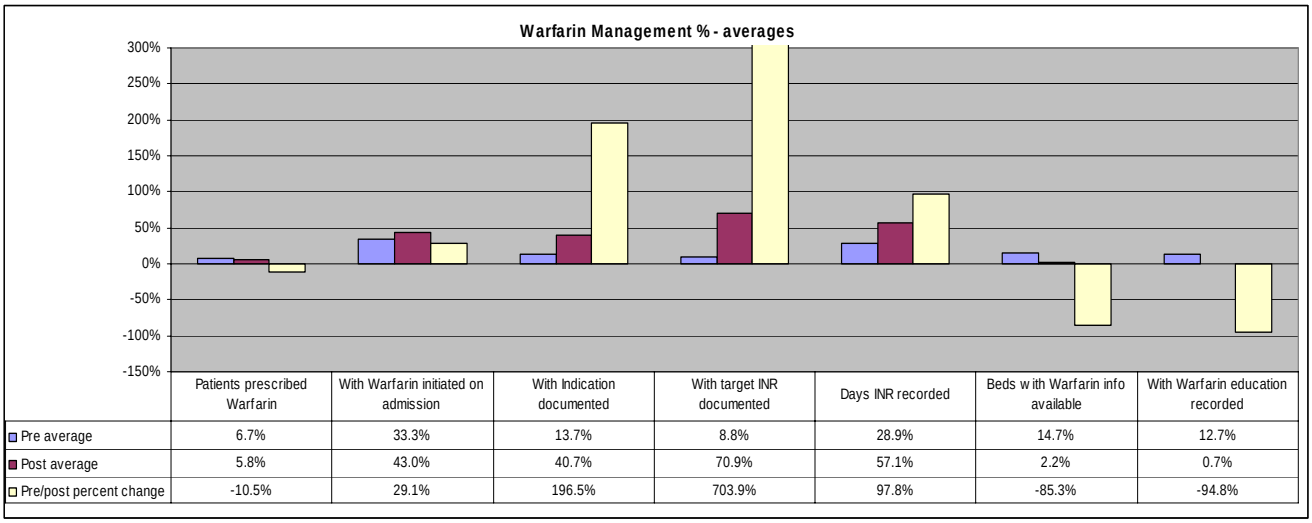
Medication charts were reviewed to examine if warfarin was prescribed, if INRs were recorded in the same place that warfarin was prescribed and whether or not dosing guidelines were available. It should be noted that unlike the NIMC, many pre-existing medication charts (at the pre-implementation audit stage) lacked the facility to record indication, target INR range and INR result. Figures 21 and 22 illustrate the documentation of warfarin prescribing information (i.e. target INR, indication, INR results and daily dose.) Inclusion of these parameters provides decision support at the time of prescribing and administration. The INR is not expected to be recorded 100% of time, but should be documented when Warfarin has been initiated or dosing regimen altered.

Fig 21:



	Patients prescribed Warfarin	With Warfarin initiated on admission	With Indication documented	With target INR documented	Days INR recorded	Beds w ith Warfarin info available	With Warfarin education recorded
Pre average	4	1	1	0	6	1	1
Post average	3	1	1	2	7	1	0

Fig 22:



	Patients prescribed Warfarin	With Warfarin initiated on admission	With Indication documented	With target INR documented	Days INR recorded	Beds with Warfarin info available	With Warfarin education recorded
Pre average	6.7%	33.3%	13.7%	8.8%	28.9%	14.7%	12.7%
Post average	5.8%	43.0%	40.7%	70.9%	57.1%	2.2%	0.7%
Pre/post percent change	-10.5%	29.1%	196.5%	703.9%	97.8%	-85.3%	-94.8%

Comments on Warfarin documentation and administration

- The sample size of patients prescribed Warfarin was small (102 patients pre-audit and 86 patient post-audit). Larger sample sizes are needed than those collected during the NIMC pilot in order to fully evaluate the impact on patient safety of the warfarin section of the NIMC.
- Improvement was demonstrated in the documentation of Warfarin indication and INR targets / results, with room for further improvement. Documentation of indication and INR enables staff to make informed decisions about a patient's Warfarin dose.
- Performance overall for provision of Warfarin information and education for patients was generally poor. A change to local hospital policy may be required to ensure this information is available for improving patient safety.

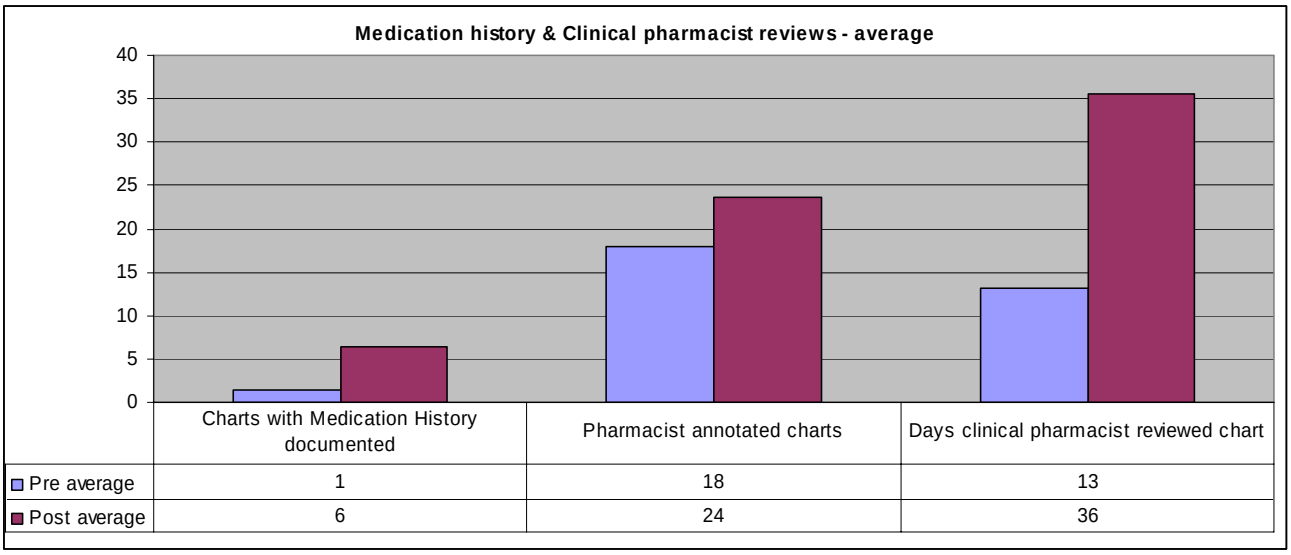
Section 9: Medication history documentation and evidence of review by a clinical pharmacist

RISK: It has been clearly demonstrated that inpatients benefit from a review of their medication regime by a clinical pharmacist. Associated activities such as liaison with medical and nursing staff are necessary to ensure safe and effective outcomes for patients. If a clinical pharmacist does not review the medication regime, patients are at greater risk of an adverse medicine event. A thorough review of medication taken prior to admission can be valuable in reconciling pre-admission therapy with inpatient medication. Documentation of the medication history on the patient's chart provides a convenient reference for all members of the clinical team.

CRITERIA: To reduce patient harm from medication errors, hospitals should have in place a process of documentation for pharmaceutical review of medication prescribing, dispensing, administration and documentation processes. Ideally, patients' medication should be reviewed regularly during their stay. The acuity of the patient and availability of pharmacy resources should determine the frequency of review.

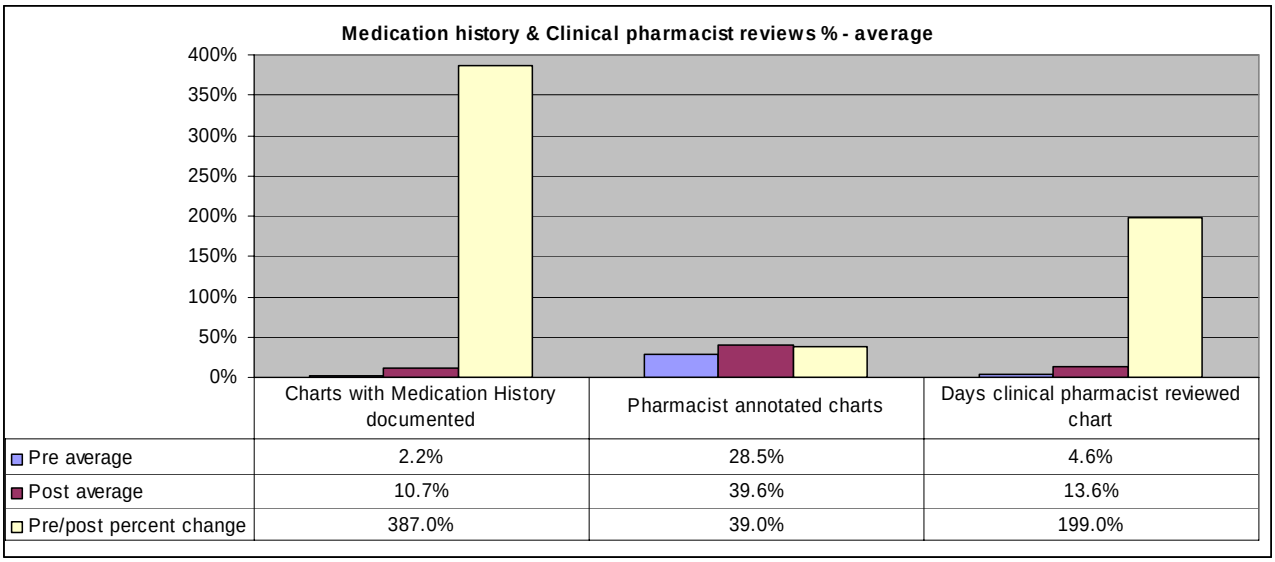
Figures 23 and 24 display a comparison between the medication history and the documentation of clinical pharmacist review pre and post-implementation in both average number (Fig.23) and percentage (Fig.24).

Fig 23:



	Charts with Medication History documented	Pharmacist annotated charts	Days clinical pharmacist reviewed chart
Pre average	1	18	13
Post average	6	24	36

Fig 24:



	Charts with Medication History documented	Pharmacist annotated charts	Days clinical pharmacist reviewed chart
Pre average	2.2%	28.5%	4.6%
Post average	10.7%	39.6%	13.6%
Pre/post percent change	387.0%	39.0%	199.0%

Comments on medication history and clinical pharmacist review

- Improvement was demonstrated in the documentation of medication history on the medication chart (from 2.2% to 10.7%), however further improvement could be made in this area. Generally, recording medication history on the medication chart was not a common practice. Instead, medication history would be recorded in the patient's case notes and not necessarily readily available at the point of prescribing. Inclusion of this information on the medication chart provides a convenient decision support tool for the prescriber.
- Improvement was also demonstrated in the annotation of medication charts by clinical pharmacists. Inclusion of this section on the NIMC facilitates the evaluation of pharmaceutical review processes, in accordance with the recommendation by Health Ministers that pharmaceutical review should be implemented in hospitals by December 2006 in order to improve patient safety.
- Hospitals vary in levels of pharmacy services available, therefore these results are only indicative of actual practice, which varies significantly.

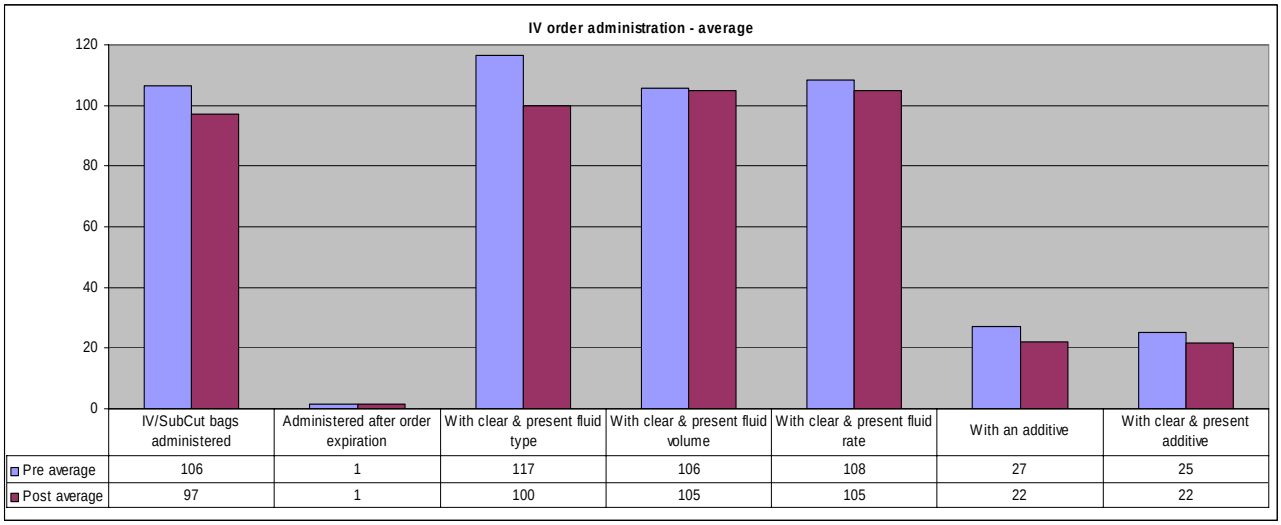
Section 10: Intravenous fluid orders

RISK: Systems that allow multiple infusions to be given against one order, or to be administered for longer than a 24hr period, have been shown to result in inadequate review of fluid and electrolyte requirements. This has the potential to lead to adverse events.

CRITERIA: A single infusion bag should be administered against a single order. Volume, rate, fluid type and any additive/s should all be unambiguously and legibly documented.

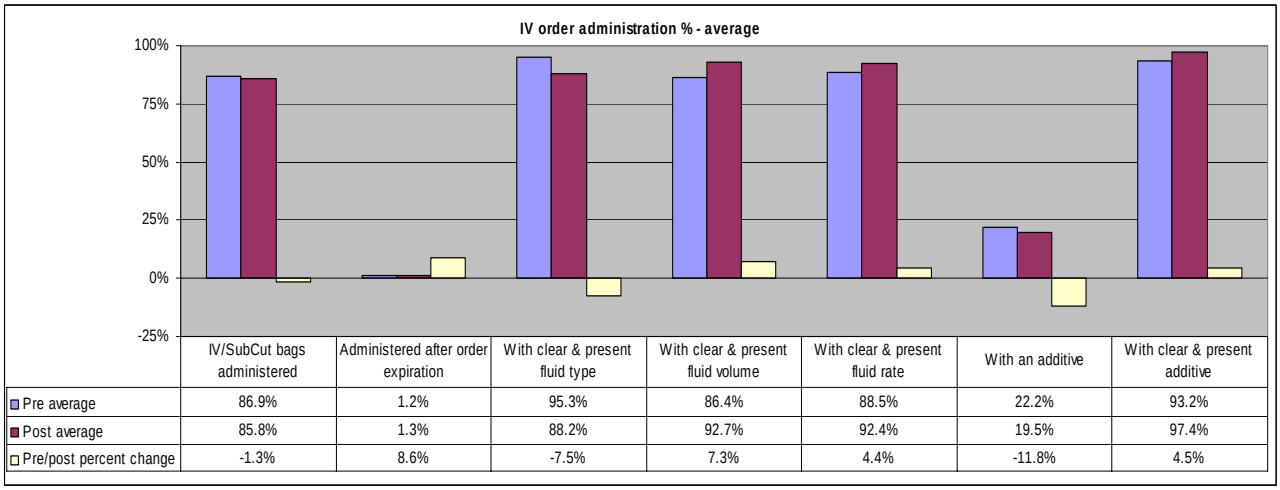
Figures 25 and 26 display a comparison between intravenous and sub-cutaneous fluid orders and administration pre and post-implementation in both average number (Fig.25) and percentage (Fig.26).

Fig 25: IV and Sub-cut fluid order administration in value terms



	IV/SubCut bags administered	Administered after order expiration	With clear & present fluid type	With clear & present fluid volume	With clear & present fluid rate	With an additive	With clear & present additive
Pre average	106	1	117	106	108	27	25
Post average	97	1	100	105	105	22	22

Fig 26: IV and Sub-cut fluid order administration in %



	IV/SubCut bags administered	Administered after order expiration	With clear & present fluid type	With clear & present fluid volume	With clear & present fluid rate	With an additive	With clear & present additive
Pre average	86.9%	1.2%	95.3%	86.4%	88.5%	22.2%	93.2%
Post average	85.8%	1.3%	88.2%	92.7%	92.4%	19.5%	97.4%
Pre/post percent change	-1.3%	8.6%	-7.5%	7.3%	4.4%	-11.8%	4.5%

Comments on IV fluid orders

- Performance on documentation of IV fluid orders in pre and post-implementation orders was generally good. There were minimal changes between pre and post implementation audits of IV fluid orders, however it should be noted that not all sites reported data on audit fields relating to IV fluid orders.

Appendix A

National Inpatient Medication Chart Pilot – Participating Sites

Alice Springs Hospital, NT
Bateman's Bay District Hospital, NSW
Belmont Hospital, NSW
Broadmeadows Health Service, VIC
Broome-Kimberley Health Services, WA
Calvary Healthcare, ACT (Private)
The Canberra Hospital ICU, ACT
Central Gippsland Health Services, VIC
Flinders Medical Centre, SA
Freemasons Hospital, VIC (Private)
Hamilton Hospital Western District, VIC
John Hunter Hospital, NSW
Joondalup Health Campus, WA
Kalgoorlie Regional Hospital, WA
Launceston General Hospital, TAS
Maitland Hospital, NSW
Melbourne Health, VIC
Moruya District Hospital, NSW
Murwillumbah Hospital, NSW
Naracoorte Hospital, SA
Newcastle Mater Misericordiae, NSW
Noarlunga Hospital, SA (Private)
Noosa Hospital, QLD (Private)
The Queen Elizabeth Hospital, SA
Royal Newcastle Hospital, NSW
Royal Prince Alfred Hospital, NSW
Tamworth Base Hospital, NSW
Tweed Heads Hospital, NSW
Warrnambool Hospital, VIC
West Gippsland Healthcare Group, VIC
Whyalla Hospital and Health Services, SA

National Medication Chart Working Group

Summary Rationale for a National Medication Chart

Ensuring a patient in a hospital bed receives the best therapy in an accurate and safe manner is a complex process involving many health professionals including doctors, pharmacists and nurses. One critical element of this process is the communication of the prescription to allow safe and accurate dispensing and administration. A body of evidence exists to suggest that this communication can be made safer if parts of this communication processes are made with a better understanding of various safety principles and with some standardisation of these processes to minimise the possibilities of inadvertent errors.

Most of the benefit of having a National Medication Chart, or at least a series of best practice principles for the design and use of a Medication Chart nationally, comes from having a greater awareness that the prescribing process can result in direct patient harm and a greater awareness of the strategies and processes to minimise this harm.

Key principles

1. When a medication chart is first written up, the patients name should always be written at the top of the chart by hand by the prescriber, to minimise the hazard of ordering for the wrong patient by acting as a double check for pre-labelled charts.
2. When subsequent new prescriptions are written the chart should always be checked that it is the correct patient.
3. A medication chart should have a section on the chart to record adverse reaction information, which includes documentation if a reaction is unknown, the nature of the reaction (if one has previously occurred), when that reaction occurred and signed accountability. The section should be clearly visible whenever most prescriptions are written.
4. A single chart should have space to include once only and premedication orders so that they are neither on a separate chart that is dislocated from the main regular orders or part of the regular orders. This minimises the risk of missed doses from separate charts or orders being inadvertently continued, as well as providing a more complete medication history on the single chart.
5. Telephone orders should be discouraged, unless essential due to work practice restrictions (e.g. rural settings, hospitals with no resident medical staff). Where telephone orders are essential, the medication chart should contain a section that facilitates and encourages safe practice whereby two staff should independently receive the order and that the order is read back to the prescriber. These orders need to allow for up to 4 doses to be administered before counter signing.
6. There should be space on the medication chart to record medicines taken by the patient prior to admission. Currently this process is disjointed and often located in various parts of the patient record or held by pharmacy staff and neither with the record or the medication chart. Having this information always on the main medication chart facilitates communication of changes made during admission by the attending health professionals back to the GP.
7. A medication chart should have a specific section for prescribing variable dose drugs with this section facilitating the recording of and prompting for test results required to determine the next dose. It is recommended that this variable dose section be on the inside of the chart with other regular orders to reduce risk of omissions.
8. A medication chart should have a specific section for prescribing warfarin. Nearly 10% of the adult population is now on warfarin and it is regularly a drug that causes adverse events. The warfarin section will have space for documenting both INR targets and results and prompts to ensure the next dose is ordered in a timely fashion (e.g. 4pm to ensure morning results are reviewed and the next dose ordered prior to the conclusion of the day medical shift).

9. A medication chart should have a specific section for “when required” (prn) medications to remove them from cluttering the regular medication section. The prn orders should be ordered in a structured manner of dose or range of doses with minimum hourly frequency to be administered and a recommended maximum dose in 24 hours, together with an indication.
10. A medication chart should have a specific section to enable nurse initiated medication in line with State regulations and hospital practices.
11. The chart should encourage recording the date medication is started, NOT the date the chart is re-written.
12. The chart should encourage generic drug name use.
13. The chart should discourage the use of abbreviations and/or clearly identify acceptable abbreviations.
14. The chart should encourage and facilitate the prescriber recording the times of administration based on a hospital agreed standard. This reduces the possibility of transcription errors by nurses in establishing the frequency for doses to be administered.
15. The chart should have space for clinical pharmacist annotation to communicate information required for optimal administration.
16. The chart should have space for pharmacy documentation of the medication supplied.
17. The chart should be structured to facilitate the dispensing of discharge medication directly from the chart to avoid transcription errors. This may not be currently possible for those sites using the PBS system for discharge medications due to PBS administrative requirements at present.
18. The chart should have space for the prescriber to clearly identify themselves and how they can be easily contacted (e.g. page number).

A National Medication Chart that follows these principles has been developed and is about to be piloted in 20 sites around the country. The benefits of introducing a chart following these principles will be maximised if undertaken in a controlled manner with appropriate training of medical, nursing and pharmacy staff to understand the principles and how to best use the modified processes. Usually this will require the identification of staff resources that can provide dedicated time to the implementation of the changes for a period of time (e.g. 6 months).

In addition, it needs to be understood that while these principles have been tested and proven in various hospital settings, the magnitude of the benefits will vary depending upon your existing charts and processes. It is recommended that sites introducing the changes undertake pre-audits of current prescribing and administration practices and follow the introduction with follow up audits to ensure the benefits have been realised at a hospital level. To facilitate this, the Working Group is developing an audit tool kit, but again the hospital will need to allocate resources to ensure this occurs.

Suggested educational material will be available through the Safety and Quality Council as a component of the implementation process.

Finally, it should be noted that it is anticipated that the use of hand written medication charts, prescription records and administration recording will eventually be replaced with electronic prescribing and administration recording which will eliminate many of the issues currently being considered in the National Medication Chart process. In addition, electronic prescribing will have the potential to bring many more patient benefits with intelligent decision support. Hence the current National Medication Chart process needs to be seen as a parallel and complementary process to electronic prescribing and administration recording initiatives around the country.

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