AUSTRALIAN COMMISSION ON SAFETY AND QUALITY IN HEALTH CARE

National Inpatient Medication Chart

2009 National Audit Report

December 2011

Acknowledgment
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This report is based on work prepared for the Australian Commission on Safety and Quality in Health Care by Dr Ian Coombes with contributions from David McDougall, Susan McLeod and Associate Professor Charles Mitchell of the Centre for Safe and Effective Prescribing, School of Pharmacy, University of Queensland

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1. Executive summary

1.1 Overview

This report forms a component of an ongoing National Inpatient Medication Chart (NIMC) quality improvement process and describes findings from audits of the NIMC undertaken during 2009 and reported to the Australian Commission for Safety and Quality in Health Care (the Commission). Data from four states (Australian Capital Territory, Northern Territory, Tasmania and Western Australia) are included in the overall aggregate analysis and Queensland data have been added to the jurisdictional comparison but are not included in the overall analysis.

The findings are described in relation to the specific sections of the NIMC as they relate to the safety features that were introduced, through the NIMC, to reduce medication errors and adverse drug events. Comparisons from these 2009 audits are made with the post-implementation audit of the NIMC pilot chart in 2006 and subsequent jurisdictional audits undertaken in 2007 and reported in 2008 by the Commission. It should be noted that the sites in each of the three audits are not matched and many audit criteria have changed since the NIMC pilot.

The report describes differences between previous audits and the 2009 audit and differences between regular and long stay, and adult and paediatric, versions of the chart. Comments are made in each table of results. Conclusions are made on the current use of the NIMC. The report identifies areas for improvement in the use of the chart and recommends changes to the audit process for consideration by the Commission's Health Services Medication Expert Advisory Group.

1.2 Background

In 2004, Australian Health Ministers agreed to implement a standard National Inpatient Medication Chart (NIMC) in all Australian public hospitals to reduce harm to patients from medication errors. An initial pilot in 31 sites, and analysis of 22 matched sites data, showed a significant reduction in prescribing errors and reduced risks of subsequent adverse drug events (ADEs). The NIMC was subsequently implemented across public hospitals in all jurisdictions and many private hospitals during 2006 and 2007. The Commission is charged with maintaining national version control of the NIMC and is advised on this responsibility by an expert, representative group, the Health Services Medication Expert Advisory Group (formerly the NIMC Oversight Committee).

The Commission recommends that hospitals undertake annual audits of NIMC use and share these findings with the Commission with the objective of further improving the NIMC.

1.3 Aim

The aims of the ongoing NIMC quality improvement process are to:

1. Evaluate the use of the NIMC and compliance with its safety features; and
2. Recommend changes to ensure the NIMC continues to assist in reducing the risk of harm to patients from medication errors and preventable adverse drug events (ADEs).

1.4 Method

This analysis is a snap shot observational audit of use of the NIMC to evaluate the current effectiveness of its safety features. The audits were undertaken in hospitals in four jurisdictions using the *NIMC Audit Tool* (see Attachment 3) and available from the Commission web site.[1] Participation in the audits was voluntary. Where appropriate, the 2009 data has been compared with post-implementation pilot data from 2006. It should be noted that the sites were unmatched and that many prescribing audit definitions have been altered over the three years. The pre and post-pilot data have been re-analysed for the purpose of this report. Data are also compared with audit data included in the *NIMC Quality Improvement Project* completed in 2008.

1.5 Results of 2009 Audit

Data were supplied from Australian Capital Territory, Northern Territory, Tasmania and Western Australia. Data were submitted by Queensland after the time of the aggregate analysis and these data are included in only some of the comparative tables.

The data from the four jurisdictions were obtained from 864 patients, with 1,138 medication charts, the majority of which were the standard adult NIMC and included 9,047 medication orders.

From the 2009 data, it appears that the NIMC has had a variable effect on some aspects of prescribing safety since its introduction in 2006-07, and with a corresponding potential to reduce medication errors and preventable ADEs. Compared to the 2006 post-NIMC pilot data, there have been improvements in a range of prescribing practices that potentially could improve patient safety. Examples of improvements are listed in Table 1.

Table 1: Examples of improvements in compliance with safety features of the NIMC

Criteria for safe prescribing	Rate of compliance	
	2006 post NIMC pilot audit	2009 audit
Patient identification completed (all patients)	19.8%	31.3%
Patients' weight documented • all patients • paediatric patients	19.1%	 23.1% 75.7%
Complete details of previous ADR documented (drug name and reaction or nil known)	29.4%	62.7%
Indication for warfarin documented	34.3%	62.1%
Patients with drugs prescribed of a similar class (duplication)	13.3%	10.8%
Medicines prescribed by generic name	73.0%	80.2%
Sustained release forms of drugs identified	37.7	46.4%

There was a similar rate of prescribing of medicines that previously caused adverse drug reactions (ADRs) (7.7% vs. 7.3%) and of frequency errors in PRN orders (32.2% vs. 35.6%) between the 2006 post implementation audit and the 2009 audit.

Opportunities for medication errors and possible ADEs remain as a result of incomplete or unclear documentation of certain aspects of prescribing information and medication-related

patient information. All jurisdictions reported at least some activities with an increased opportunity of error and which is listed in Table 2. However, on balance, the audit shows that the safety of prescribing continues to improve.

Table 2: Examples of increased opportunities for error

Criteria for incomplete or unclear medication orders	Audit results	
	2006 post NIMC pilot audit	***2009 audit***
Unclear names prescribed	3%	7.6%
Route errors (missing, unclear, incorrect)	6.5%	13.3%
Dose errors (missing, unclear, incorrect) Unclear doses	4.3% N/A	18.4% 16.4%
Regular & PRN frequency errors (missing, unclear incorrect)	15.5%	20.0%
Error prone abbreviations used	N/A	22.6%
Indication documented	22.8%	14.5%
Orders ceased correctly	N/A	24.1%

Many of these increases in opportunities for error may be explained by the introduction of nationally endorsed, unacceptable abbreviations which were not included as errors in the 2006 audits.[2]

The number of errors relating to missing (undocumented) routes and missing doses remained low in 2009 (1.2% and 0.8% respectively). Incorrect route, incorrect dose and incorrect frequency errors were also low at 1.2%, 1.1% and 0.5% respectively,

Despite the warfarin section not being used for all patients receiving warfarin (23 of 29), in those patients where the warfarin section was used compliance with the completion of the indication documented increased from 34.3% in 2006 to 60.9% in 2009 and documentation of the target INR remained stable with 70% in 2006 and 29% in 2009 . Documentation of patient education on warfarin remains low at 10% vs. 11% in 2006.

Apart from warfarin, the indication for prescribing a drug was poorly documented and significantly fewer orders had an indication than in 2006.

Over all the standard of prescribing documentation on paediatric charts was higher than on adult charts. There were significantly fewer unclear drug names, dose instruction errors and frequency errors. 61.3% of orders on paediatric NIMCs had clear name, route, dose and frequency compared to 49.4% on adult NIMCs. This disparity may be worth further investigation.

Documentation by pharmacists remains low with less than 30% of orders being annotated and only 40% of patients documented as having received a pharmaceutical review.

Almost 10% of orders appeared to have been omitted, or not signed for, by nursing staff, a similar figure to the 2006 pilot.

1.6 Recommendations

1.6.1 Possible focuses for improving use of the NIMC

There is low compliance with several safety features of the NIMC and in some elements significant variation in the level of compliance between jurisdictions.

1: It is recommended that the Health Services Medication Expert Advisory Group consider strategies to address poor levels of compliance with NIMC safety features that carry a high risk for causing patient harm. (See Table 3)

Table 3: NIMC safety features with poor compliance

Safety feature	2009 audit result
1. Patient identification	31% complete
2. Patient weight	23% documented (total) 76% documented (paediatric)
3. ADR documentation	63% complete
4. Warfarin - indication - education provided to patient	 61% documented 10% documented
5. Sustained release box	46% ticked for SR products
6. Designated medicine name, route, dose and frequency sections	51% adult medication orders unclear 39% paediatric medication orders unclear 36% PRN frequency error rate (and which could be a particular focus of attention) 23% medication orders contained one or more error prone abbreviations*
7. Paediatric dose calculation box	25% paediatric doses calculated and documented
8. Intermittent medicines	59% administration section boxed correctly
9. Indication box	15% indications documented. Poor compliance across all jurisdictions.
10. Pharmacy annotations	27% of medication orders were annotated by pharmacists
11. Pharmaceutical review	40% had a pharmaceutical review documented

*Error prone abbreviations, particularly the use of s/l for routes, mcg for doses, q4h and od for frequency, remain at an unacceptably high level and should be a continued focus for safe prescribing education.

1.6.2 Possible focuses for future NIMC national audits

There were a number of issues relating to the audit process that have been identified and may have implications for future national auditing.

2: It is recommended that the Health Services Medication Expert Advisory Group consider the recommendations on conduct of future NIMC national audits. (See Table 4)

Table 4: Recommendations for future audits

Issue	Assessment and background	Recommendation
2. Inter-rater reliability of auditors	Some of the results of 2009 audit varied significantly between jurisdictions. This may have been a result of variations in prescriber behaviour but may also have been due to misinterpretation by the auditors.	Review the training of auditors and revise training materials including definitions and examples. Consider collaborating with NPS to develop an on-line education program for auditors. Ensure completion of training prior to undertaking audits.
3. Inability to compare 2009 data with post pilot data	Unmatched sites. It is not known if any of the sites in 2009 participated in the 2006 post implementation of NIMC pilot.	Consider specifically approaching the original 22 pilot sites for the 2011 audit and using similar audit tools to those used in 2006
4. Inability to compare 2009 data with previous data	Definitions of errors have changed. The introduction of unacceptable abbreviations has increased the number of “unclear” orders significantly. Similarly definitions have changed for ADR documentation and patient identification.	Ensure reporting of missing prescribing details is reported and discussed separately.
5. Duplication errors	It is unknown if the duplication errors are regular and PRN orders for the same drug or two regular orders on separate medication charts. The clinical significance of these errors is unknown.	Further explore these types of errors
6. PRN dosing and frequency errors	Data were missing for PRN maximum doses and issues raised about denominators	Once daily doses do not require hourly dosing to be specified. A specific audit on PRN orders should be undertaken.
7. Errors associated with “unclear” orders	HSMEAG to consider if it is important to separate errors due to no dose, route or frequency ordered from use of error prone abbreviations	Report errors with no dose, route or frequency ordered separately from use of error prone abbreviations
8. Use of ADR alert stickers	Only 30% compliance with this element.	Consider the value of auditing this element.
9. Availability of warfarin guidelines	Very low compliance with this element – 12%. Not used in several jurisdictions.	Consider the value of auditing this element.

1.7 Conclusion

The NIMC 2009 National Audit data (from five jurisdictions only) may not be totally representative of NIMC use. However, compared with the 2007 data, there appears to have been an improvement in the safety of prescribing, administering and reviewing documentation in many areas. There is also continued improvement compared with the 2006 post-NIMC pilot data.

The 2009 audit shows that there are opportunities for further reducing the risk of medication errors, particularly those associated with the communication of prescribing decisions to other medical, nursing and pharmacy staff. Only in one jurisdiction was there a consistent improvement in the completeness and clarity of orders.

The national audit process continues to:

1. Highlight areas of improvements in patient safety;
2. Identify specific areas on which some or all jurisdictions may wish to focus medication safety strategies in 2011; and
3. Add significantly to the evidence base for NIMC quality improvement.

2 Background to the National Inpatient Medication Chart

Medication errors are among the most common incidents reported in public hospitals[3-4] with prescribing errors potentially the most serious of medication errors.[5] A recent study commissioned by the General Medical Council UK (GMC) found that 5.9% of consultants and 10.3% of trainee doctors in UK hospitals had made prescribing errors in one week.[6] Approximately 50 percent of medication errors and adverse drug events ADEs are deemed preventable.[7-10]

The causes of prescribing errors and ADEs are multifactorial[7-8 11] and multiple interventions are required to reduce errors, at the level of the individual, team, system, environment and culture.[8 12] Research into why prescribing errors occur identified that a culture exists where drug selection is seen as the critical component of prescribing.[8 11] The processes of selecting forms, routes and doses of drugs and communicating those decisions by completing a medication chart is seen as a low risk chore which is frequently delegated to inexperienced junior doctors.[8]

Prescribing can be considered as a four stage process, with each stage affecting the next. These steps are:

1. Gathering patient and drug information;
2. Making a decision in selecting the correct drug, form, route, dose and duration of treatment depending on patient characteristics and other co-morbid diseases and drug therapy;
3. Communicating the decisions by generating instructions for the supply and administration of these drugs; and
4. Reviewing the outcome and revising the prescribing decisions.[13]

Solutions developed to reduce prescribing errors should consider all of the stages of prescribing. Electronic prescribing with clinical decision support and forcing functions to ensure complete and legible communication and instructions offers a partial solution to reducing prescribing errors.[14] However such systems are currently not widely available in Australian hospitals and have also been associated with introducing errors not seen in paper systems.[14-15]

The medication chart remains a critical form of communicating prescribing decisions and instructions between doctors, pharmacists and nurses, and acts as a record of medication administration and supply. Changes to the layout of medication charts have been shown to reduce the frequency of prescribing errors.[16] In 2004, when a standard chart was introduced to five sites in one area of South East Queensland, a significant reduction in the frequency of prescribing errors was observed, from 20% to 15.8% of orders per patient.[17] At that time, multiple different medication charts existed within and across Australian hospitals.

A lack of standardisation in prescribing charts has been cited as contributing to some prescribing errors.[18] Standardisation of medication charts has the potential to reduce the opportunity for errors caused by unfamiliarity with different charts as clinicians move between clinical units and hospitals.[19 20] Standard systems also provide an opportunity to train both students and clinicians in their use by using centrally produced material. There have been calls for a standard chart in the UK to improve safety of prescribing.[6 21]

In 2004, Australian Health Ministers agreed the introduction of a common medication chart. *"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 where ever the patient is within a hospital". [*Australian Health Ministers' Joint Communiqué, 23 April 2004].

The development of the National Medication Inpatient Chart (NIMC) was overseen by the National Inpatient Medication Chart Working Group chaired by Dr John Youngman. A range of safety features was included in the chart after considering evidence from the analysis of medication errors. Multiple versions of chart design were developed and tested before the final version was piloted in 2006. (See Appendix 1 for a copy of the current NIMC.)

The aim of the pilot study was to determine whether a standardised chart, shown to reduce significantly prescribing errors in a five site study in one state, could be successfully adapted, introduced and achieve similar benefits in a range of sites across other States and Territories.[17] The pilot intervention (introduction of the chart) was preceded and accompanied by local education of doctors, nurses and pharmacists.

The NIMC pilot study was a prospective, before-and-after, observational audit of prescribing errors including documentation of adverse drug reaction (ADR) details and specific details regarding prescribing of warfarin. It was undertaken by trained pairs of nurses and pharmacists using a standard data collection tool.

The main outcome measures were:

- Frequency of prescribing errors per patient;
- Rate of errors per order per patient and the completion of ADR details; and
- Warfarin documentation before and after the introduction of the NIMC.

The pilot study reviewed 1,328 patients' charts, including 15,557 orders from 22 public hospitals. The post implementation audit in the same 22 sites included 1,234 patient charts and 15,416 orders. After the introduction of the NIMC, prescribing errors decreased by almost one-third, from 6,383 with a median (range) of 3[0-48] per patient pre to 4,293, 2[0-45] per patient post ($p<0.001$). The documentation of drugs causing previous ADR increased significantly from 81.9% to 88.9% ($p<0.001$). The documentation of the indication for warfarin increased from 12.1 to 34.3% ($p=0.001$) and the documentation of target INR increased from 10.8% to 70% ($p<0.001$).

Following the pilot, the NIMC was implemented widely across Australia in 2006 and 2007 in public hospitals and many private hospitals.

The Commission is responsible for maintaining national version control of the NIMC and for reducing national barriers to implementation. The Commission is advised on these responsibilities by an expert, representative group, the Health Services Medication Expert Advisory Group (formerly the NIMC Oversight Committee). Annual audits of NIMC use are undertaken by jurisdictions and private hospitals in a range of sites and the results shared with the Commission as part of an ongoing NIMC quality improvement process.

The aim of the audits undertaken in 2009 was to evaluate if safety features continued to be of benefit to patient care and if there were specific aspects of prescribing behaviour, the NIMC or the audit process that might require modification and should be considered by the Health Services Medication Expert Advisory Group.

3 Method – 2009 audit

This analysis is a snap shot observational audit of in-hospital prescribing and use of the NIMC to evaluate the current effectiveness of the safety features of the NIMC. The clinical appropriateness of drug, route, dose or form selection was not otherwise examined.

The study involved an observational audit of prescribing and administration documentation errors. The definition of prescribing error was adapted from that of Dean et al: *"A prescribing decision or prescription writing process that results in an unintentional, significant reduction in the probability of treatment being timely and effective or increases the risk of harm, when compared with generally accepted practice".*[22] Agreed definitions and examples of types of prescribing errors aligned with the stages of prescribing are explained in each separate result table and are explained in detail in the *NIMC Audit Tool*[1] and *NIMC Audit Tool User Guide*[23].

Types of charts audited were:

- NIMC;
- NIMC long-stay version;
- NIMC paediatric version;
- NIMC long-stay paediatric version.

Continuous infusions, insulin, chemotherapy, acute and chronic parenteral analgesia, discharge and electronically generated charts were not included in the audits.

All hospitals (public and private) were invited to participate in the audit through the Commission's ACSQHC Inter-Jurisdictional and Private Hospital Sector Committees. An expression of interest was posted on the Commission's website. (See Appendix 2 – *NIMC National audit expression of interest*.) Participation was voluntary. Sites were recruited on the basis that they used a conforming NIMC and were authorised to share their data.

The audit was undertaken during August and September 2009. A standard audit tool was used to collect the data (see Appendix 3) and the *NIMC Audit Tool User Guide*[23] was available to provide guidance for the observers on conduct of the audit.

Hospitals were guided in the number and type of charts audited as indicated in the *NIMC Audit Tool User Guide 2009.* Hospitals were encouraged to audit all NIMC charts. Where this was not feasible, the following sample size was recommended.

Table 5: Suggested hospital audit sample size

Number of adult beds in hospital	Sample size
150 or more	20% of current patients
30-149	30 current patients
Less than 30	All current patients

Two observers undertook direct observational audits. It was recommended that audit teams comprised a registered nurse and a pharmacist if available, otherwise a medical officer or another nurse.

All available NIMCs on medical, surgical, paediatric and mental health wards were audited to identify and document prescribing errors, using established definitions.[22] All medication orders on active NIMCs were reviewed including those cancelled or previously changed.

Inter-rater reliability was not determined. However, both observers had to agree on errors. A third auditor was involved if any disagreement occurred.

The audit tool was provided in electronic format and the data submitted to the Commission electronically.

Analysis of data

Where appropriate, 2009 data have been compared with post-implementation pilot data from 2006 and that obtained for the 2008 *NIMC Quality Improvement Project*. This latter data were collected mainly in 2007.

It must be noted that the sites in the 2006 pilot, and those in the 2007 and 2009 audits, were unmatched and many prescribing audit definitions have been amended over the three years since the pilot.

The pre and post-pilot data has been published by Dr Ian Coombes and others in the *British Journal of Clinical Pharmacology* in 2011.[24]

4 Results of 2009 NIMC audit

Twenty five hospitals from four States and Territories participated in the audit, including two tertiary referral hospitals and one specialist paediatric hospital. A total of 864 patient charts were audited and 9,047 medication orders reviewed. Data from a fifth state were included in the jurisdictional comparisons increasing the number of patients to 1,293.

The results of the data analysis are presented in tables relating to individual NIMC safety features.

The tables list the national data and compares results of the three audits, the 2006 post pilot NIMC audit, jurisdictional audit data from 2007 State and Territory audits provided for the 2008 *NIMC Quality Improvement Project*, and the 2009 national audit data.

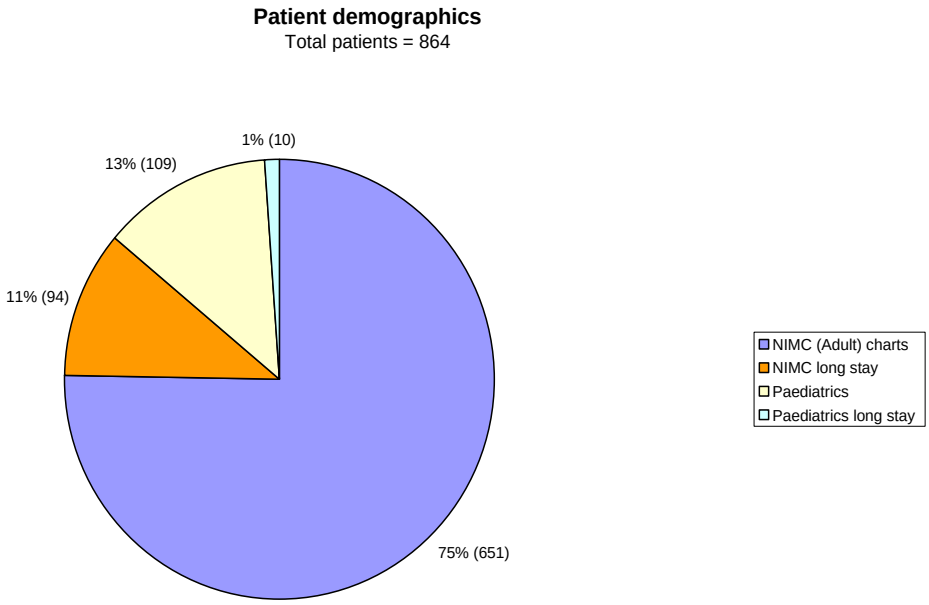
The national data is followed by a discussion on the results from the different jurisdictions (J1 – J5).

4.1 Demographics (for aggregate analysis excluding J5)

4.1.1 Patient demographics

There were 864 patients included in the audit. The majority of patients (86%) were prescribed medicines on adult charts. Some of these patients may have been paediatric patients.

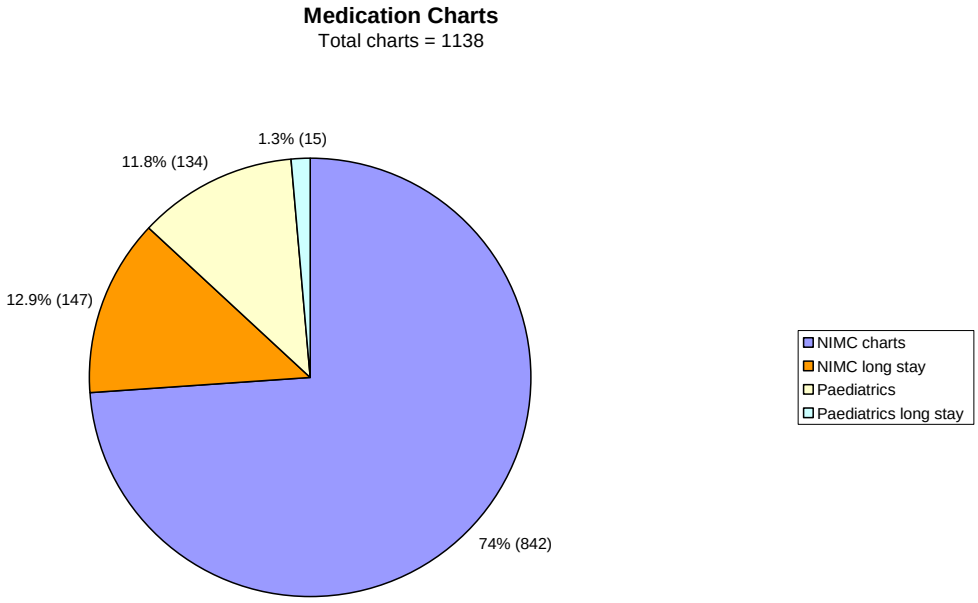
Figure 1: Patient demographics



4.1.2 Medication charts

In total 1,138 charts were audited, the majority being the NIMC and the NIMC long-stay version charts. Paediatric charts comprised 13.1% of the charts used. See Figure 2

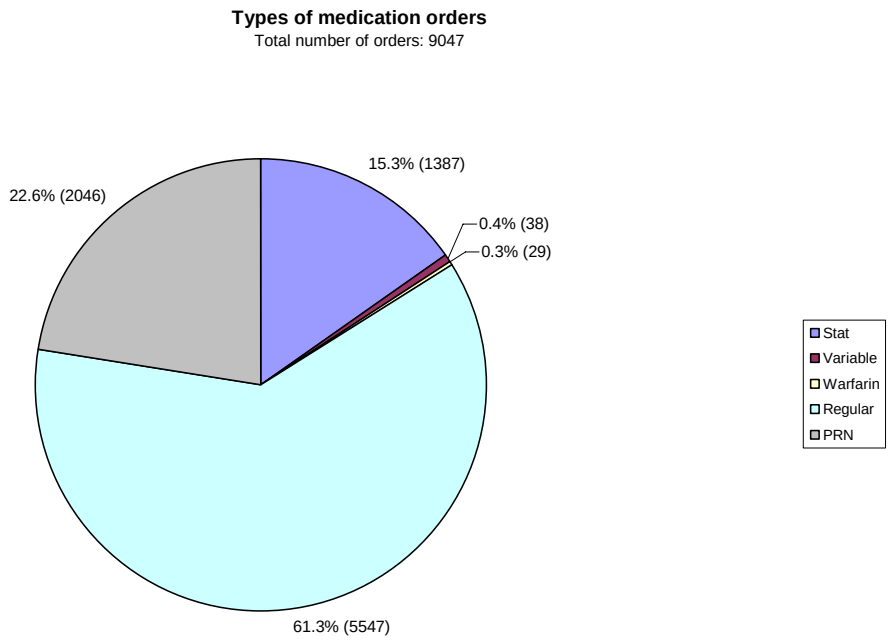
Figure 2: Medication charts audited



4.1.3 Medication orders

Over 60% of orders were for regular medicines with PRN orders being the next most common order. Variable dose and warfarin orders accounted for less than 1% of all orders. This translates to 4.6% of adult patients with warfarin prescribed. See Figure 3.

Figure 3: Types of medication orders



Data used for aggregate analysis (excludes J5)

The break down of data on number of patients, chart type and by State and Territory is provided in the following tables.

Table 6: Breakdown of data by state and territory

Patients	**J1**	**J2**	**J3**	**J4**	**Sum**
NIMC	306	213	47	85	651
NIMC long-stay	89	5	0	0	94
NIMC paediatric	47	44	3	15	109
NIMC paediatric long-stay	8	2	0	0	10
ALL PATIENTS	**450**	**264**	**50**	**100**	**864**
Medication Charts	**J1**	**J2**	**J3**	**J4**	**Sum**
NIMC charts	400	270	61	111	842
NIMC long stay	139	8	0	0	147
Paediatrics	60	53	3	18	134
Paediatrics long stay	11	4	0	0	15
ALL CHARTS	**610**	**335**	**64**	**129**	**1,138**
Medication orders	**J1**	**J2**	**J3**	**J4**	**Sum**
Stat Only orders	856	331	35	165	1387
Variable dose orders	9	14	4	11	38
Warfarin orders	16	10	0	4	29
Regular orders	2,582	1,816	361	788	5,547
PRN (as required) orders	1,066	655	81	243	2,046
TOTAL NUMBER OF ORDERS	**4,529**	**2,826**	**481**	**1,211**	**9,047**

4.2 Use of NIMC safety features

Note a fifth jurisdiction's data was released after the initial aggregate analysis was undertaken

4.2.1 Patient Identification & Weight

Complete identification requires unique record number (URN), patient name, patient address and date of birth on pages 3 and 4 of the chart.

Weight is to be recorded on at least one medication chart for NIMC or NIMC long-stay version and on all medication pages of NIMC paediatric versions.

Patient identification and weight – National (excludes J5)

Criteria	2006 post NIMC	2007 audit	2009 Denominator	Numerator (%)	Target	Comment
% of patients with *complete identification* on all pages of medication chart	19.8%	N/A	864	270 (31.3%)	100%	Significant improvement compared with post NIMC audit.
% of patients with *weight* documented	19.1%	N/A	864 119 (paeds only)	200 (23.1%) 90 (75.7%)	100%	Low compliance with recording of patients' weight for adults. Nearly 3/4 paediatric charts had the weight documented.

Patient identification and weight – By jurisdiction (J1 – J5)

There was significant variation between jurisdictions in rates of recording for both patient ID and patient weight, with some jurisdictions performing better than others. Results for recording complete patient ID on all charts of each patient ranged from 23.8% to 70%, with a mean score of 42.8%, while results for documenting patient weight ranged from 8% to 27.8%, with a mean score of 18.3%.

4.2.2 Adverse drug reaction (ADR)

Complete ADR documentation requires nil known, unknown or ADR with drug name and reaction documented and a clinician's signature.

ADR documentation – national (excludes J5)

Criteria	2006 post NIMC	2007 audit	2009 Denominator	2009 Numerator (%)	Target	Comment
Of the patients whose charts were audited, % with *complete ADR documentation* on all charts	29.4%	17.6 - 34%	864	542 (62.7%)	100%	Significant improvement with recording of complete adverse drug reactions (ADR) details, completed more than twice as often than in post-NIMC audit and 2007 audits. However further improvement is needed.
Of the patients with a previous ADR, % of patients with ADR *alert stickers in place*	ADR stickers not widely in use in 2006	N/A	165	49 (29.7%)	100%	Low compliance with application of ADR alert stickers. May not be available in all jurisdictions. Should this be a mandatory requirement or optional? Exclude from future audits if the latter.
Of the patients with a previous ADR, % of patients with *similar class of ADR medication prescribed* on chart	7.7%	4.0 – 23.5%	165	12 (7.3%)	0%	Whilst small numbers, it appears that this safety feature has been maintained at a similar level

ADR Documentation - by jurisdiction (J1-J5)

All jurisdictions demonstrated a significant improvement in documentation since the 2007 audit. Figures for complete ADR documentation ranged from 57.1% to 86% in 2009 compared to 17.6% to 34% in 2007.

4.2.3 Medication History (excludes J5)

Criteria	2006 post NIMC	2007	2009 Denominator	2009 Numerator (%)	Target	Comment
Of the patients whose charts were audited, % where clinicians can access *medication history* either via NIMC or Medication Action Plan (MAP) Medication history, including "nil Regular medications", on current medication chart	9%	N/A	789 (excludes pts with MAP)	103 (13.1%)	100% (- % using MAP)	Low compliance with recording of patients' medication history or cross referencing location of medication history on separate form/MAP. In Qld, where a MAP has been rolling out for 4 years, 11% of patients still have a medication history on their medication chart.
Of the patients whose charts were audited, % with a medication history documented on *MAP form*	N/A	N/A	761 (Excludes pt with med history on chart)	75 (9.8%)	100% (-% using medication chart)	During 2009, only some sites had developed a local form of MAP – no national role at this time. In Qld, 26% of all patients had a MAP
Of the MAP forms audited, % with *complete ADR documentation*	N/A	N/A	75	42 (56.0%)	100%	Low compliance with recording of ADR details
Of the medications documented on the MAP form, % with *Dr's Plan on Admission* documented	N/A	N/A	75	52 (69.3%)	100%	Small numbers but relatively good compliance with recording of *Dr's Plan on Admission*
Of the medications documented on the MAP form, % with *Reconcile* column ticked	N/A	N/A	73	49 (67.1%)	100%	Relatively good compliance with documentation of reconciliation

4.2.4 Warfarin (excludes J5)

Total warfarin orders refers to warfarin orders prescribed in the NIMC Warfarin and Regular sections. It was noted that 6 patients had warfarin prescribed in regular or stat sections of the medication chart.

There was no significant variation in warfarin documentation between jurisdictions.

Criteria	2006 post NIMC	2007	2009 Denominator	2009 Numerator (%)	Target	Comment
Of the patients whose charts were audited, % with *Guidelines for Anticoagulation using Warfarin* at end of patients' bed or with NIMC	N/A	N/A	613 (excludes paediatrics and J3 and J4)	76 (12.4%)	100%	Low compliance with availability of warfarin guidelines at the point of prescribing Only used with adult patient beds. Not used in ACT and NT and incorporated in WA anti-coagulation chart – so only expected if patient anti-coagulated. The value of continuing to collect data on this element should be discussed.
Of the total warfarin orders prescribed, % of warfarin orders prescribed in *Warfarin section*	NA	N/A	29	23 (79.3%)	100%	Moderate compliance with prescribing warfarin in warfarin section.
Of the warfarin orders prescribed in warfarin sections, % of warfarin orders with *target INR* range documented	70%	N/A	23	16 (69.6%)	100%	Similar compliance with documentation of the target INR when prescribing warfarin in warfarin section compared to when charts were introduced. Could be improved.
Of the warfarin orders prescribed in warfarin sections, % of warfarin orders with *indication* documented	34.3%	NA	23	14 (60.9%)	100%	Improved compliance with documentation of the indication when prescribing warfarin compared with the 2006 pilot.
Of the patients prescribed warfarin, % of patients with warfarin education recorded	11%	N/A	29	3 (10.0%)	100%	Very low compliance with documentation of warfarin education. Should be a focus for improvement.

4.2.5 Variable Dose Medication (excludes J5)

Criteria	2006 post NIMC	2007	2009 Denominator	2009 Numerator (%)	Target	Comment
Percentage of medicines prescribed in the *Variable dose section*	N/A	N/A	5,539 (total regular orders)	89 (1.6%)	N/A	The total number of drugs that could have been prescribed in this section is unknown.

4.2.6 Duplicated Orders

Duplicated orders refer to once only, stat, telephone Regular (including variable dose and warfarin), and PRN medication orders duplicated for the same medication or class of medication

Duplicated orders – national (excludes J5)

Criteria	2006 post NIMC	2007	2009 Denominator	2009 Numerator (%)	Comment
Of the patients whose charts were audited, % of orders where there were *duplicated orders* with the potential to harm	146 orders (0.9%)	N/A	9,047 orders	146 (1.6%)	Although the number of duplicated orders is small this is a potentially clinically significant issue that should be further explored.

Duplicated orders – by jurisdiction (J1-J5)

There was significant variation across jurisdictions in this category of error. Results ranged from 0.02% to 2.0%.

4.2.7 Sustained release form specified

Sustained release medications are prescribed in the Regular order sections of the medication chart and indicated by ticking a sustained release box.

Sustained release form specified – national (excludes J5)

Criteria	2006 post NIMC	2007	2009 Denominator	2009 Numerator (%)	Comment
Of the sustained release (SR) medication orders prescribed, % SR medications with *SR box ticked*	37.7%	15.4 – 54.0%	317	147 (46.4%)	Low compliance with using the Slow Release (SR) tick box to identify slow release forms of medications. 20% improvement since the 2006 pilot

Sustained release form specified – by jurisdiction (J1-J5)

All jurisdictions demonstrated improvement in this category although there remains significant variation across jurisdictions. Results in 2009 ranged from 38.3% to 79% compared with 15.4% to 45% in 2007.

4.2.8 Pharmaceutical review (excludes J5)

Jurisdictional data were not available for 2009.

Criteria	2006 post NIMC	2007	2009 Denominator	2009 Numerator (%)	Comment
Of the patients whose charts were audited, % with at least one *pharmaceutical review* documented in charts	N/A	N/A	864	345 (39.9%)	Moderate compliance with documentation of pharmaceutical review.

4.2.9 Drug name errors (excludes J5)

Unclear name refers to a medication that could be interpreted as another medication or the order is illegible

Criteria	2006 post NIMC	2007	2009 Denominator	2009 Numerator (%)	Comment
Of the medication orders audited, % of medications (each drug order type) with trade name	27% excluded "acceptable combination names"	N/A	9,047	1,794 (19.8%)	Of note is that there was no significant difference between jurisdictions. The list of approved combination names that may be accepted at different sites may differ. This was not taken into account. The practice of using generic names has continued to improve since introduction of the chart, and may reflect a consistent approach to generic prescribing
Of the medication orders audited (each drug order type), % of medications with name unclear	3%	2 – 16.0%	9,047	676 (7.5%)	Moderate compliance. Increase in orders with unclear medicines names since 2006 may reflect the introduction of the *Recommendations for Terminology, Abbreviations and Symbols used in the Prescribing and Administration of Medicines* in 2008 and the principle of not abbreviating any medicine name.

There was a variation in the frequency of unclear drug names between types of chart. Orders on adult charts had a higher incidence of unclear names (28.2%) compared with paediatric charts (18.7%).

Drug name errors – by jurisdiction (J1-J5)

Across jurisdictions, the percentage of drugs ordered by brand names in 2009 varied from 14.8% to 21.7%.

There was a significant variation amongst the jurisdictions in rates of medication orders with unclear names in 2007, ranging from 0.2% to 11.7%. This was a slight improvement over 2007 where the range was 0.8% to 16%. However in three jurisdictions the rate of unclear names prescribed in 2009 increased.

4.2.10 Route errors - Route is unclear (excludes J5)

Unclear route maybe be where an abbreviation is used that could be misinterpreted. For example, SC can be mistaken for SL and vice versa; or the wrong route for the medication is prescribed such as *Ampicillin 1g IV* ordered when it should have been prescribed *IM*.

Prescribing	2006 post NIMC	2007	Denominator	Numerator (%)	Comment
Of the medication orders audited (each drug order type), % of medications with *missing* route	N/A	N/A	9,047	110 (1.2%)	Good compliance with documentation of route
Of the medication orders audited (each drug order type), % of medications with *unclear* route	N/A	N/A	9,047	982 (10.9%)	Moderate compliance with clearly documenting the route
Of the medication orders audited (each drug order type), % of medications with *incorrect* route	N/A	N/A	9,047	112 (1.2%)	Good compliance with indicating the correct route
All route errors	6.5%	0.9 – 17.0%	9,047	1,204 (13.3%)	The introduction of the *Recommendations for Terminology, Abbreviations and Symbols used in the Prescribing and Administration of Medicines* in 2008 identifying error-prone abbreviations for route of administration may explain in part the doubling of route errors e.g. S/C for subcutaneous is no longer accepted and Sub Cut or subcutaneous is required

Route errors – by jurisdiction (J1 – J5)

The majority of jurisdictions reported an overall reduction in all route errors since 2007, although one jurisdiction reported an increase. Rates of all route errors reported in 2009 ranged from 0.2% to 18.1%.

4.2.11 Dose errors (excludes J5)

Dose is unclear when metric and Arabic systems are not used. Incorrect dose for the medicine is recorded when an incorrect dose is prescribed, e.g. Heparin 50000units subcutaneous BD as opposed to 5000units

Criteria	2006 post NIMC	2007	2009 Denominator	2009 Numerator (%)	Comment
Of the medication orders audited (each drug order type), % of medications with *missing* dose	N/A	N/A	9,047	74 (0.8%)	High compliance with documentation of dose
% of medications with *unclear* dose	N/A	N/A	9,047	1,486 (16.4%)	Low compliance with clearly documenting the dose
% of medications with *incorrect* dose	N/A	N/A	9,047	102 (1.1%)	Good compliance with prescribing the correct dose
All Dose errors	4.3%	2.4 – 15.0%	9,047	1,662 (18.4%)	A significant increase in dose errors since previous audits. The main category of error is unclear orders. The increase in the list of error prone abbreviations categorised as unclear may have contributed to the higher error rate
Paediatric doses calculated and documented	N/A	N/A	873	220 (25.2%)	Poor compliance with documenting calculated paediatric doses
Paediatric doses correctly calculated	N/A	N/A	220	203 (92.3%)	Should remain a focus for both auditing and training.

Dose error – by jurisdiction (J1 – J5)

Most jurisdictions performed poorly compared with 2007 audits with a variation in dose error rates in 2009 from 0.8% to 23.6% compared with 2.4% to 15% in 2007.

All jurisdictions reported high rates of correctly calculated paediatric doses in 2009, ranging from 86.4% to 100% however only 22.2% to 55.6% of paediatric doses had a calculated dose documented.

4.2.12 Frequency errors

Frequency is unclear if illegible or unacceptable abbreviations are used. For example, *Frusemide 40mg qd* is not an acceptable frequency. Wrong frequency is the incorrect frequency for medication prescribed, for example *Gentamicin 320mg IV BD* as opposed to once daily.

Frequency errors – national (excludes J5)

Criteria	2006 post NIMC	2007	2009 Denominator*	2009 Numerator (%)	Comment
Of the medications audited (regular, PRN, variable), % of medications with *missing* frequency	N/A	N/A	7,593	387 (5.1%)	Moderate compliance with documentation of frequency
Of the medication orders with frequency documented % of medications with *unclear* frequency	N/A	N/A	7,593	1,090 (14.4%)	Moderate compliance with clearly documenting the frequency
Of the medication orders with frequency documented % of medications with *incorrect* frequency	N/A	N/A	7,593	39 (0.5%)	High compliance with prescribing the correct frequency
Regular frequency errors only	(9.0%)	2 - 19%	5,539	792 (14.2%)	Additional criteria of unclear abbreviations may have contributed to increase in error rate in 2009 audit
PRN frequency errors only	(32.2%)	7.5 - 54%	2,049	724 (35.3%)	Commonly, minimal hourly interval not used. Most frequency errors are for PRN orders and could be a focus for further attention.
All variable, regular, PRN frequency errors	(15.4%)	N/A	7,593	1,516 (20.0%)	NIMC = 20.2%, Long stay = 20.7%; Paeds = 16.8%, Paeds long stay = 19.7%

*2009 denominator excludes, stat, variable dose and warfarin as no frequency required (pre-printed fro variable dose and warfarin)

Frequency errors –by jurisdiction (J1 – J5)

All jurisdictions, with one exception, had between 20.8% and 32% of errors in the frequency ordered for all orders. This rate was higher for PRN orders. The rate of frequency errors in regular medication orders increased across all jurisdictions from the 2007 audit to the 2009 audit.

4.2.13 Intermittent medication

Where medicines are prescribed for intermittent administration, for example once weekly, the administration boxes on those days when the medicine is not to be administered are required to be blocked or crossed out. This is to reduce the risk of the medicine being given on days it is not ordered.

4.2.14 Intermittent dosing of medication – national (excludes J5)

Criteria	2006 post NIMC	2007	2009 Denominator	2009 Numerator (%)	Comment
Of the intermittent (i.e. weekly) medications prescribed, % of administration sections with boxes blocked correctly	N/A	N/A	111	66 (59.5%)	Although compliance was moderately good there remains a high risk of intermittent medications being administered daily.

Intermittent dosing of medication – by jurisdiction (J 1- J 4)

The number of medicines with intermittent doses was small. The percent of orders with the administration boxes blocked correctly ranged from 38.3% to 76.1%.

4.2.15 Frequency of administration times equal to prescribed frequency

Criteria	2006	2009 Denominator	2009 Numerator (%)	Comment
% of the orders of regular, variable medicines where times match frequency	98.1%	NA	NA	Error in data collection as in some jurisdictions, the number of orders that correlated was greater than the total number of regular orders

4.3 Prescribing errors

This section includes the data that measures the effect of the chart features designed to improve the completeness and clarity of prescribing instructions on the quality of prescribing.

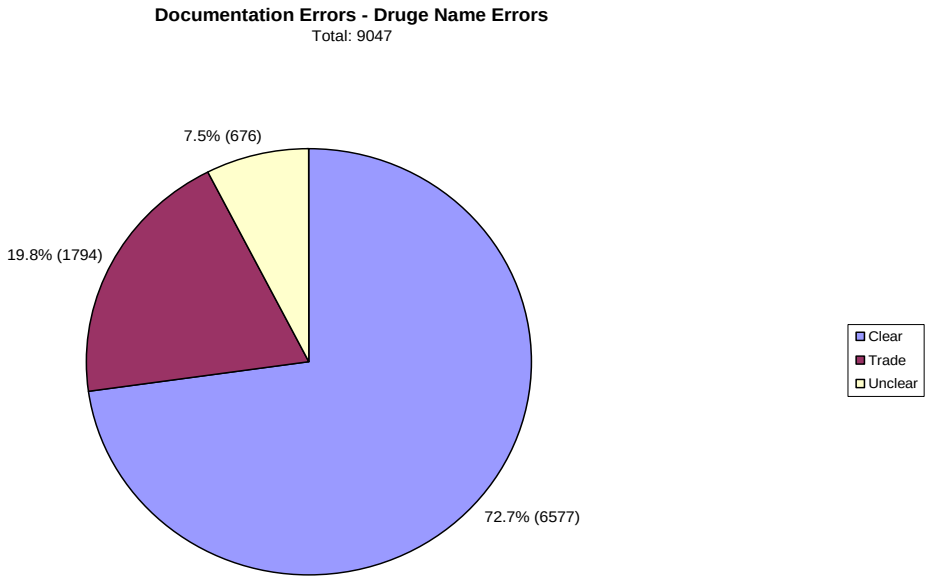
4.3.1 Drug Orders

Errors in drug orders i.e. prescribing errors, are defined as unclear, illegible or missing orders, or the use of unapproved abbreviations when prescribing drug names, route of administration, dose and frequency.

Drug name errors

7.6% of drug names were unclear i.e. illegible, could be misinterpreted as another drug or were abbreviated e.g. AZT. See Figure 4.

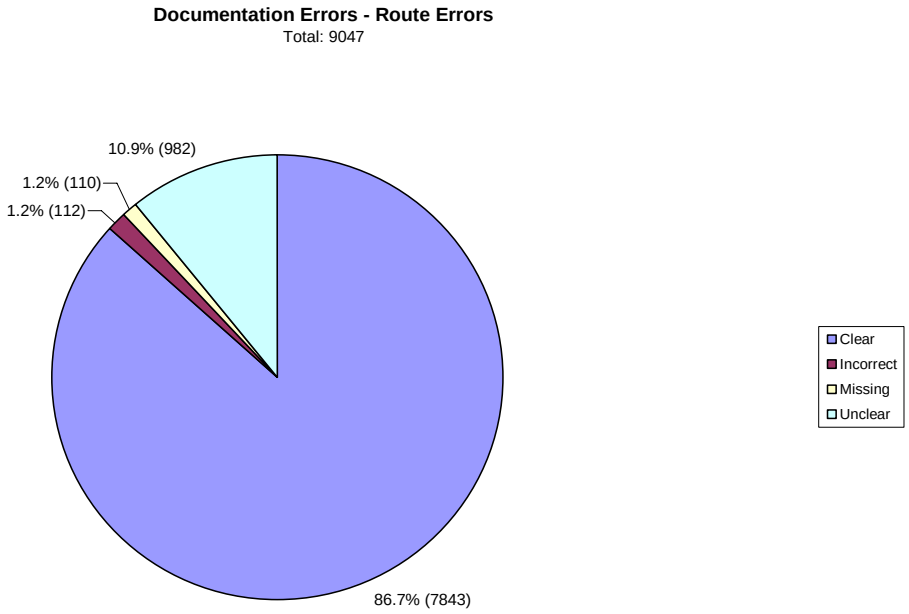
Figure 4: Drug name errors



Route Errors

10.9% of route errors were unclear i.e. contained an unapproved abbreviation or illegible route. See Figure 5.

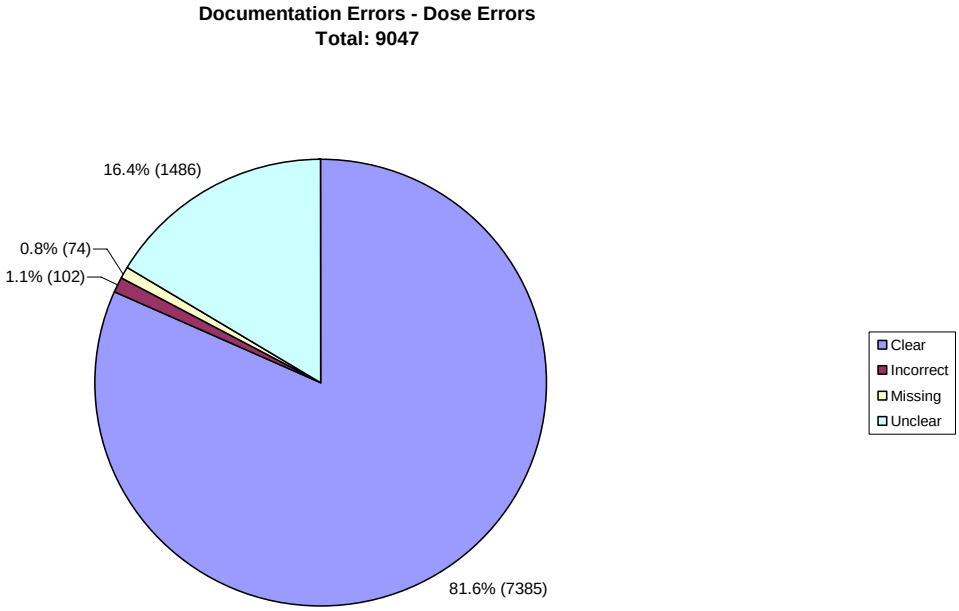
Figure 5: Route of administration errors



Dose errors

Overall 16.4% of doses prescribed were unclear. In only 0.8% of orders was the dose of medicine not prescribed. See Figure 6.

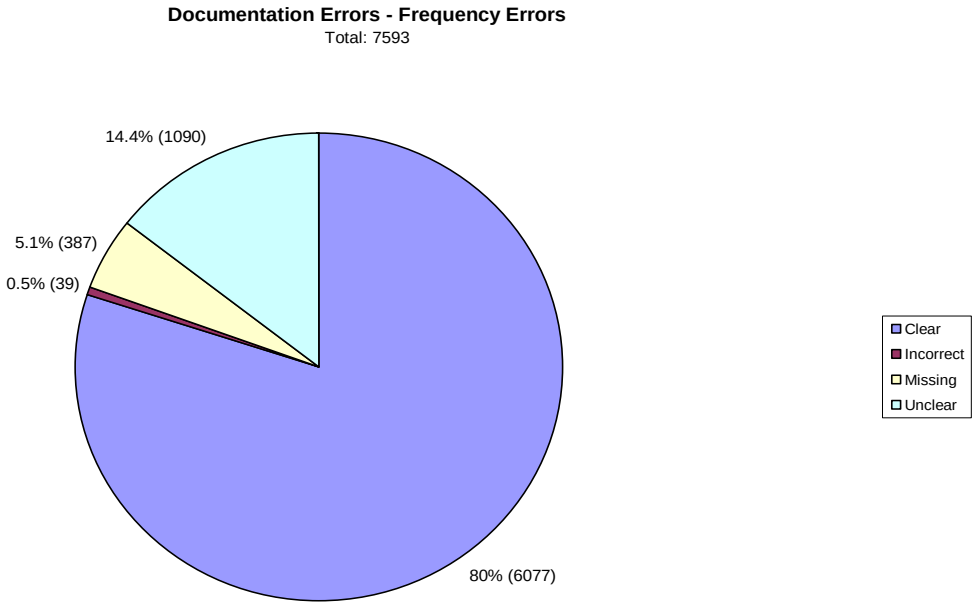
Figure 6: Dose errors by type



Frequency Errors

12.4% of dosage frequencies ordered were unclear with less than three quarters of frequencies ordered assessed as clear. See Figure 7.

Figure 7: Frequency errors by type



4.3.2 Unclear orders

Almost 50% of medication orders had at least one medication error that was an unclear instruction.

Criteria	2006	Denominator	Numerator (%)	Comments
Of the medication orders audited (each drug order type), % of orders prescribed with one or more **unclear** instructions for drug name, route, dose **or** frequency	74.0% of patients had at least one error	9,047	4,471 (49.4%) orders had at least one error	High incidence of unclear orders. Note: 2006 pilot data was entered per patient not per order.

4.3.3 Prescribing errors by chart type 2009

The following table lists the prescribing errors by chart type with percentages bracketed.

Table 7: Prescribing errors by chart type

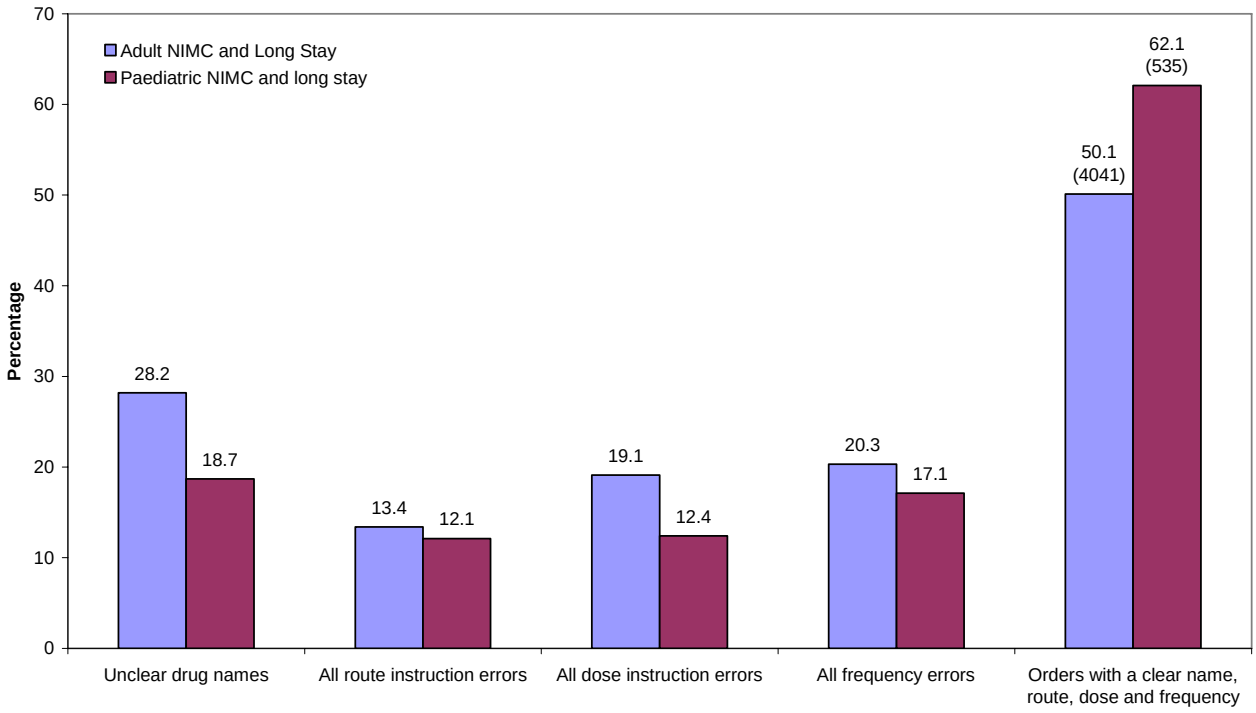
	Adult charts		Paediatric charts		
	NIMC	NIMC Long-Stay	Paediatric NIMC	Paediatric NIMC Long-Stay	Total
Drug Order					
Stat	1,071 (14.78)	141 (15.23)	167 (20.90)	8 (10.81)	1,387 (15.33)
Variable	37 (0.51)	1 (0.11)	0 (0)	0 (0)	38 (0.42)
Warfarin	28 (0.39)	1 (0.11)	0 (0)	0 (0)	29 (0.32)
Regular	4,419 (60.97)	653 (70.52)	432 (54.07)	43 (58.11)	5,547 (61.31)
PRN	1,693 (23.36)	130 (14.04)	200 (25.03)	23 (31.08)	2,046 (22.62)
Drug Name					
Clear	5,164 (71.25)	703 (75.92)	645 (80.73)	65 (87.84)	6,577 (72.70)
Trade	1,503 (20.74)	182 (19.65)	103 (12.89)	6 (8.11)	1,794 (19.83)
Unclear	581 (8.02)	41 (4.43)	51 (6.38)	3 (4.05)	676 (7.47)
Route					
Clear	6,254 (86.29)	821 (88.66)	699 (87.48)	69 (93.24)	7,843 (86.69)
Incorrect	97 (1.34)	6 (0.65)	8 (1.00)	1 (1.35)	112 (1.24)
Missing	76 (1.05)	12 (1.30)	22 (2.75)	0 (0)	110 (1.22)
Unclear	821 (11.33)	87 (9.40)	70 (8.76)	4 (5.41)	982 (10.85)
Dose					
Clear	5,864 (80.91)	756 (81.64)	700 (87.61)	65 (87.84)	7,385 (81.63)
Incorrect	94 (1.30)	8 (0.86)	0 (0)	0 (0)	102 (1.13)
Missing	59 (0.81)	8 (0.86)	7 (0.86)	0 (0)	74 (0.82)
Unclear	1,231 (16.98)	154 (16.63)	92 (11.51)	9 (12.16)	1,486 (16.43)
Frequency *					
Clear	4,877 (79.79)	621 (79.31)	526 (83.23)	53 (80.30)	6,077 (80.03)
Incorrect	27 (0.44)	1 (0.13)	8 (1.27)	3 (4.55)	39 (0.51)
Missing	305 (4.99)	59 (7.54)	19 (3.01)	4 (6.06)	387 (5.10)
Unclear	903 (14.77)	102 (13.03)	79 (12.50)	6 (9.09)	1,090 (14.36)

** Excludes stat, warfarin, and variable dose orders*

4.3.4 Comparison of adult and paediatric prescribing instruction errors

Over all the standard of prescribing was higher on paediatric charts than on adult charts. Drug names were more clearly documented and there were significantly fewer instruction and frequency errors. See Figure 9.

Figure 9: Comparison of adult and paediatric prescribing instruction errors (2009 audit)



4.3.5 Error prone abbreviations in use

Error prone abbreviations include use of U or u for unit, SC or S/C for subcutaneous, and no leading zero before a decimal point (e.g. .5mg for 0.5mg).

Error prone abbreviations – national (excludes J5)

Criteria	2006 post NIMC	Denominator	Numerator (%)	Comment
Of the medication orders audited (each drug order type), % of orders containing ***1 or more*** **error prone abbreviations**	NA	9,047	2,042 (22.6%)	High use of error prone abbreviations to document route, dose and frequency

Error prone abbreviations – by jurisdiction (J1 – J5)

There was significant variation in the use of error prone abbreviations across jurisdictions with some jurisdictions having much higher rates. Rates ranged from 2.3% to 28.0%.

4.3.6 Indication documented

Indication documented - national (excludes J5)

Criteria	2006 post NIMC	Denominator	Numerator (%)	Comment
Of the medications audited (regular, PRN, variable, warfarin & all), % of orders with indication documented	22.8% of orders	7656	1,133 (14.5%)	Low compliance with documentation of indication for all medications (excluding once only medications). Results are lower than in the 2006 pilot. This could be considered a future focus for quality improvement.

Indication documented – by jurisdiction (J1 – J5)

All jurisdictions were uniform in the poor rate of documentation of indication for use of a drug with most rates around 12%. The highest being 19.8%

4.3.7 Pharmacy Annotation

Pharmacy annotation – national (excludes J5)

Criteria	2006 post NIMC	Denominator	Numerator (%)	Comment
Of the medication orders audited (each drug order type), % of orders with pharmacist annotation present	36.2% of charts in post pilot had 1 or more order annotated	9,047	2,402 (26.6%)	Difficult to compare but there is a still a significant gap in documentation of pharmacist review of medication orders

Pharmacy annotation – by jurisdiction (J1 – J5)

There was significant variation between jurisdictions which may indicate the availability of pharmacists or variation in practice. Results ranged from 12.0% to 64.9%.

4.3.8 Prescriber signature and identifier

Prescriber signature – national (excludes J5)

Criteria	2006 post NIMC	Denominator	Numerator (%)	Comment
Of the medication orders audited (each drug order type), % of orders **signed by prescriber**	98.8%	9,047	8,795 (97.2%)	High compliance with prescriber signing orders.
Of the medication orders with prescriber signature (each drug order type), % of orders where **prescriber name is clear**	78.3%	9,047	6,021 (66.6%)	Moderately good compliance with the prescriber clearly documenting their name.

Prescriber signature – by jurisdiction (J1 – J5)

All jurisdictions reported high compliance with prescribers signing orders. The results ranged from 96.3% to 98.9%. Rates of compliance with the prescriber clearly documenting their name were lower and displayed much greater variation. The results ranged from 58.5% to 83.8%.

4.3.9 Ceased Orders

Orders are ceased correctly when a clear line is drawn through the prescription and administration records and a reason is provided for the cessation.

Ceased orders – national (excludes J5)

Criteria	2006	Denominator	Numerator (%)	Comment
Of the ceased medication orders audited (regular, PRN, variable, warfarin & all), % of orders ceased correctly	N/A	1,256	303 (24.1%)	Low compliance with ceasing of medications according to hospital policy/medication chart guidelines. High risk of ceased orders being transcribed on another chart or at discharge. Could be considered a future focus for attention.

Ceased orders - by jurisdiction (J1 – J5)

There was significant variation between jurisdictions with rates of orders being ceased correctly ranging from 2.6% to 97.8%

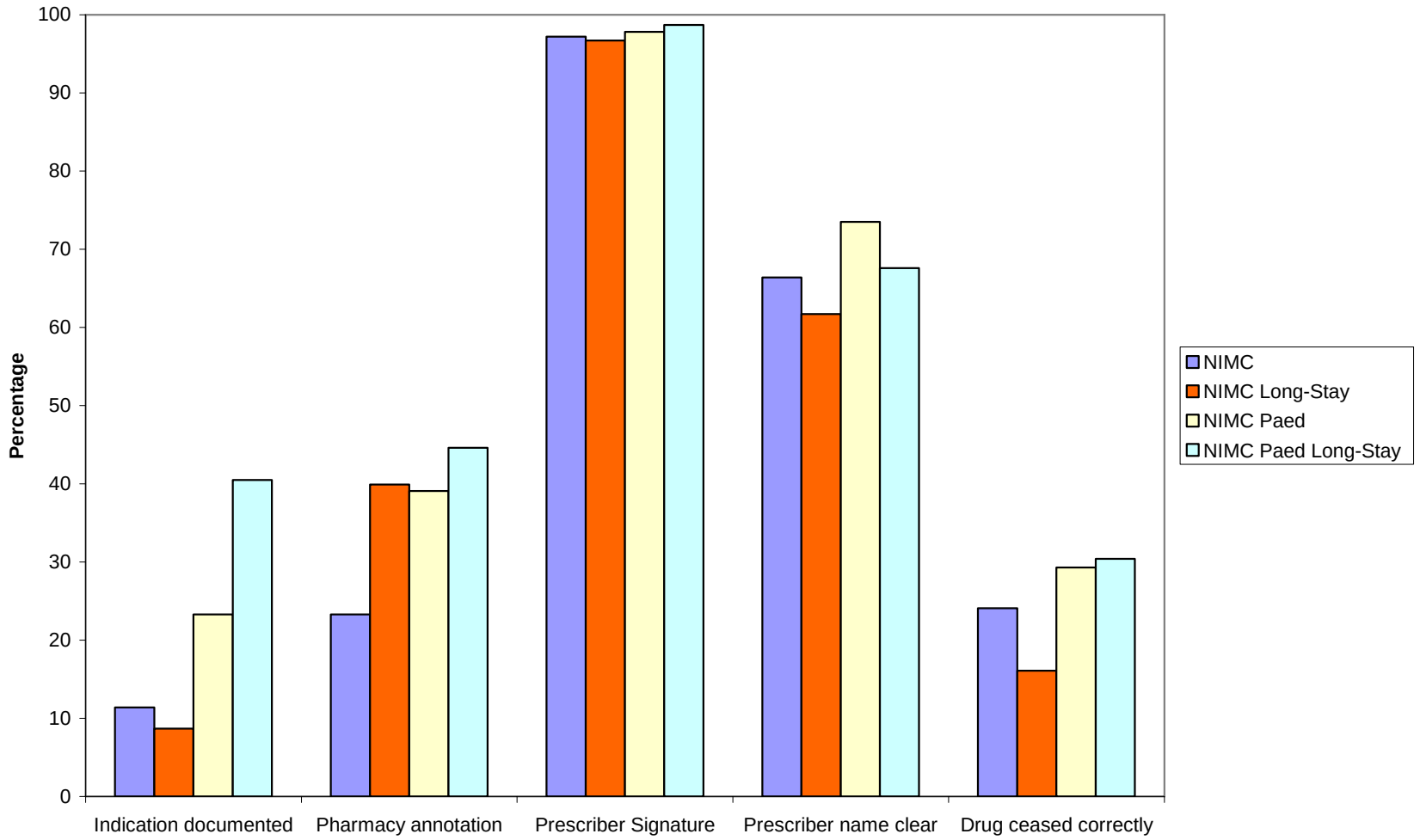
4.3.10 PRN maximum dose documentation

Data not available

4.3.11 Prescribing instruction errors by chart type

The indication for the use of drugs was documented with a significantly greater frequency on paediatric charts. Drugs were also correctly ceased more often on paediatric charts. See Figure 9.

Figure 9: Comparison of instruction errors by chart type



4.4 Administration documentation errors

4.4.1 Administration not signed for – assumed omitted

Criteria	2006	Denominator	Numerator (%)	Comment
Of the doses required (regular, stat only, variable, warfarin, & all), % of *doses omitted*	8.3%	13,581	1,338 (9.6%)	No improvement since 2006 pilot. A 9.6% error rate of doses omitted is a cause for concern.

5 Discussion of 2009 NIMC audit data

The data for the 2009 audit of the NIMC was provided by 25 hospitals in four states and territories. A total of 864 patient charts were audited and 9,047 medication orders reviewed. The data may not be representative of prescribing practices across all hospitals and all jurisdictions.

From the 2009 data, it appears that the NIMC has had a variable effect on some aspects of prescribing safety since its introduction in 2006-07 with a corresponding potential to reduce medication errors and possible ADEs. Compared to the 2006 post-NIMC pilot data there have been improvements in a range of prescribing practices that potentially could improve patient safety. Examples of improvements are listed in Table 1.

Table 1: Examples of improvements in compliance with safety features of the NIMC

Criteria for safe prescribing	Rate of compliance	
	2006 post NIMC pilot audit	2009 audit
Patient identification completed (all patients)	19.8%	31.3%
Patients' weight documented • all patients • paediatric patients	19.1%	 23.1% 75.7%
Complete details of previous ADR documented (drug name and reaction or nil known)	29.4%	62.7%
Indication for warfarin documented	34.3%	60.9%
Patients with drugs prescribed of a similar class (duplication)	13.3%	10.8%
Medicines prescribed by generic name	73%	80.2%
Sustained release forms of drugs identified	37.7	46.4%

There was a similar rate of prescribing of medicines that previously caused adverse drug reactions (ADRs) (7.7% vs. 7.3%) and of frequency errors in PRN orders (32.2% vs. 35.6%) between the 2006 post implementation audit and the 2009 audit.

Opportunities for medication errors and possible ADEs remain as a result of incomplete or unclear documentation of certain aspects of prescribing information and medication-related patient information. Almost 50% of medication orders had at least one medication error that was an unclear instruction. Increased opportunity of error was found in some sections of the chart in all jurisdictions, except for one, and is listed in Table 2. However, on balance, the audit shows that the safety of prescribing continues to improve.

Table 2: Examples of increased opportunities for error

Criteria for incomplete or unclear medication orders	Audit results	
	2006 post NIMC pilot audit	***2009 audit***
Unclear names prescribed	3%	7.6%
Route errors (missing, unclear, incorrect)	6.5%	13.3%
Dose errors (missing, unclear, incorrect) Unclear doses	4.3% N/A	18.4% 16.4%
Regular & PRN frequency errors (missing, unclear incorrect)	15.5%	20.0%
Error prone abbreviations used	N/A	22.6%
Indication documented	22.8%	14.5%
Orders ceased correctly	N/A	24.1%

Some of these increases in opportunities for error may be explained by the introduction of nationally endorsed unapproved abbreviations in 2009 which were not included as errors in the 2006 audits[2]. However error prone abbreviations, particularly the use of s/l for routes, mcg for doses, q4h and od for frequency remain at an unacceptably high level.

The number of errors relating to missing (undocumented) routes and missing doses remained low in 2009 (1.2% and 0.8% respectively). Incorrect route, incorrect dose and incorrect frequency errors were also low at 1.2%, 1.1% and 0.5% respectively,

Warfarin documentation

Despite the warfarin section not being used for all patients receiving warfarin, compliance with target INR remains high at approximately 70% and the percentage of warfarin orders with an indication documented increased from 34.3% in 2006 to 60.9% in 2009. Documentation of patient education on warfarin remains low at 10% vs. 11% in 2006.

Apart from warfarin, the indication for prescribing a drug was poorly documented and significantly fewer orders had an indication than in 2006.

The reported frequency with which dosing times did not correlate with the prescribed frequency could not be analysed as in some jurisdictions more dose administration times were reported as matching dosing frequencies than there were doses prescribed.

Over all the standard of prescribing documentation on paediatric charts was higher than on adult charts. There were significantly fewer unclear drug names prescribed, dose instruction errors and frequency errors. 61.3% of orders on paediatric NIMCs had clear names, route, dose and frequency compared to 49.4% on adult NIMCs.

Documentation by pharmacists remains low with less than 30% of orders being annotated and only 40% of patients documented as having received a pharmaceutical review.

Almost 10% of orders appeared to have been omitted or not signed for by nursing staff, a similar figure to the 2006 pilot.

The design of the NIMC includes a range of safety features that were derived from an analysis of common medication errors. Table 8 lists the level of compliance with these features determined from the 2009 audit results. A detailed discussion of audit results follows.

Table 8: Compliance with NIMC safety features

Medication Error	Safety Feature	Issues relating to compliance with safety features
Patient wrongly identified	Prompt for complete patient identification (ID) on top of page 3 and back page. Prompt for prescriber to print name below computer generated ID label.	Only 31.3% patients have complete ID documented. This should be a focus for improvement.
Re-exposure of patients to a drug/ class of drug previously causing an ADR	Prompt for details of drug and description of ADR.	62.7% of charts had complete details of previous ADR documented (drug name and reaction or nil known). 6% of patients were at risk of being exposed to drugs in similar class to those to which they had experienced an ADR. This continues to be an area for improvement.
Dosing error due to lack of patient weight to inform decision	Prompt for patient weight.	23.1% of all patients and 60.4% of paediatric patients had weight documented on the NIMC. This should be a focus of attention for improvement.
Discontinuity of appropriate therapy	Addition of medication history section.	The medication history section was completed in 13% of patients (includes cross referencing to a MAP). Future audits will measure uptake of the National Medication Management Plan and the continuing need for medication history section on the NIMC.
Warfarin dose and duration errors	Designated section of chart for prompt for indication and target INR. INR can be documented in dosing section.	20% of warfarin orders were not prescribed in warfarin section. 30% of orders did not have a target INR documented, almost40% did not have an indication This could be further improved. Only 10% of patients prescribed warfarin were documented as receiving education. This should be a focus of attention for improvement.
Ambiguous trade names	Prompt for generic names.	80% of medicines were prescribed using generic names.
Non-sustained release form administered or SR form inadvertently crushed	Prompt for tick if slow release medication. Explanation in centre of chart for nurses not to crush SR forms of drugs.	Only 45% of orders for sustained release products had the SR box ticked. Further improvement needed.
Lack of, or unclear, dosing instructions	Designated dose and frequency section. Prompt for prescriber to enter dosing times as well as frequency for regular drugs. Recommended administration times included on medication chart.	Only 50% of adult orders and 62% of paediatric orders had a clear name, route dose and frequency. 40% of orders for intermittent doses were not boxed correctly. Only 28% of paediatric doses had the calculation documented on the chart.
Drug prescribed, dispensed or administered for wrong indication	Indication of drug area added to regular and PRN orders	Only 14.5% of medicines had the indication documented. This should be a focus of attention for improvement.
Inability to clarify error with prescriber	Prompt for prescriber to print name and enter contact details	The prescriber name was not clear in 33% of orders.
PRN medication dosing errors	Forcing function to enter minimum number of hours between doses (hourly frequency) and maximum dose within 24 hours.	In more than 30% of PRN orders the frequency was missing or unclear. Maximum dose in 24 hours could not be analysed.

Patient details

Patient identification

Whilst many charts have an identifier, either a printed label or written by hand, in order to comply with the NIMC audit criteria, the patient's name must be hand written. In nearly 70% of cases, patient identification was incomplete. Although this is an improvement compared with 80% in 2006, patient identification is an important safety issue that should be considered a focus for attention in 2011.

To further reduce the risk of wrong patient errors the use of machine readable (e.g. bar code) technology to check bar-coded patient identification bracelets corresponding with bar-coded patient identification labels should be investigated.

Patient weight

Less than a quarter (23.1%) of patients had a weight recorded on the NIMC. Other patients may have their weight recorded on the observation charts. Weight is essential information for dosing certain high risk drugs. Whilst weight documentation is improving, it is still well below the desired level. Weight documentation is critical for safe prescribing with paediatric patients yet only two thirds of paediatric charts had a weight documented on them.

Adverse drug reaction details

Nearly two-thirds of all patients had a complete ADR history, compared to only one third after the introduction of the NIMC. This very positively reflects the perception of the importance of ADR history when prescribing and managing medicines. Patients often have a drug name in the ADR/Allergy box but not necessarily a reaction and some patients still have nothing documented in this domain.

The rate of patients re-exposed to similar class of drugs remains at 6% which, whilst the clinical significance of the errors identified is unknown, still represents a considerable risk for patient safety.

Medication history documentation

The medication history is infrequently documented on the medication chart. In those sites that have introduced a *Medication Action Plan* (MAP) or equivalent form, the history could be accessed on the NIMC or MAP for 13.1% of patients, an improvement on 2006 (9%).

10% of patients had a medication history documented on a MAP form. National roll out of the *Medication Management Plan*, a component of the Commission's medication reconciliation and High 5s programs, should improve this rate. It will be important to evaluate the use of the *Medication Management Plan*. This could possibly be done in conjunction with the 2011 NIMC national audit and will help inform any decision to remove the *medicines taken prior to presentation to hospital* section on the NIMC.

Prescription documentation

Warfarin documentation

Despite the warfarin section not being used for all patients receiving warfarin (23 of 29), in those patients where warfarin section was used compliance with the completion of the indication documented increased from 34.3% in 2006 to 60.9% in 2009 and documentation of the target INR remained stable,70% in 2006 and 69.6% in 2009. Documentation of patient education on warfarin remains low at 10% vs. 11% in 2006.

Sustained release form specified

Documentation of this instruction, and ticking of the SR box, has improved slightly from 37.7% to 46.4% reducing the risks of immediate release forms being dispensed and administered in error.

Unclear orders

The instructions for drug name, route, dose or frequency were unclear in almost 50% of medication orders. This is unacceptably high. However this measure is subjective and open to variation between audit teams.

Drug name errors

Generic prescribing has increased from 73% to 80.2% but the use of unclear names remains unacceptably high at 7.6%, an increase from 3% in the 2006 post NIMC pilot. The variation in use of unclear names differed significantly across the different jurisdictions and there were fewer unclear names prescribed on paediatric charts.

Drug route errors

The use of error prone abbreviations remains a safety risk. There appears to be no difference between adult and paediatric prescribing in drug route errors.

Dose errors

The use of error prone abbreviations remains the most frequent dosing instruction error with 16.4% of orders having an unclear dose. Only around 1% of orders had missing or incorrect doses. Noticeably, paediatric chart prescribing has significantly fewer unclear dose errors.

Frequency errors

The clear indication of intermittent dosing frequency in only 60% of cases represents a risk to patients of daily administration of potentially toxic agents such as methotrexate and bisphosphonates.

There was an anomaly in auditing frequency errors where dosing administration times did not correlate with dosing frequency. This exceeded 100% in some jurisdictions and which is not possible. See also the discussion on limitations of the audit (page 47).

Frequency errors occurred less frequently in paediatric prescribing.

As required (PRN) dosing frequency remains missing or unclear (e.g. no minimum hourly dose interval) in over 30% of orders. Maximum daily doses of PRN medicines given in 24 hours were not able to be analysed.

Error prone abbreviations

Use of s/l for routes, mcg for doses, q4h and od for frequency remain at an unacceptably high level and should be a continued focus for education on safe prescribing. There was significant variation in the use of error prone abbreviations across jurisdictions.

Indication documented

The documentation of indication overall was low at 14.5% and significantly less than in the 2006 audit (22.8%). In contrast there was a much higher level of compliance on paediatric charts,23.3% increasing to 40.5% on the long-stay paediatric NIMC.

The indication for warfarin, which has been a specific safety feature, remains high at over 60%. The indication for PRN orders was not audited separately – this should be audited separately in the future.

The importance of documenting the indication from a patient safety perspective does not appear to be recognised by prescribers and could be considered a future focus for attention.

Ceased orders

Less than a quarter of orders were cancelled in both prescribing and administration sections and prescriber signature and reason for ceasing the order documented. This is fewer than in 2006. However, the criteria in 2009 audit were stricter, in that both the ceasing prescriber's signature and the reason for cessation were required.

There was significant variation between the jurisdictions, ranging from 2.6% to 97.8%, indicating room for improvement in some jurisdictions.

Documentation by health profession

Pharmacy annotation

This still remains low at less than 30% of orders and is a significant gap in documentation by pharmacists. It may indicate a resourcing issue with pharmacists not available to review charts or poor documentation by pharmacists. This reasoning could also apply to the low (40%) level of documentation of pharmaceutical review.

Prescriber signature and identifier

Over 97% of orders were signed and two thirds of the prescriber names were legible. Possibly, the use of contact details (e.g. pager number) could also be accepted as a means of identifying the prescriber.

Nursing signatures for orders

Almost 10% of orders appeared to have been omitted or not signed for by nursing staff which is a similar figure to the 2006 post-pilot data. This remains a significantly high level of non-compliance with either administration or administration documentation and which risks omitted doses or double-dosing.

Limitations

The sites in the 2006 pilot and those in the 2007 and 2009 audits were unmatched and many prescribing audit definitions have been amended over the three years since the pilot. This placed limitations on the ability to compare some of the data. The pre and post-pilot data was re-analysed for the purpose of this report.

Data for the 2009 audit was provided by 25 hospitals from five jurisdictions only and may not be representative of prescribing practices.

Some of the data collected required subjective judgement and interpretation by the auditors e.g. determining unclear orders. Lack of consistency between auditors in interpretation may have contributed to some of the variations in the jurisdictional data.

6 Recommendations

6.1 Possible focuses for improving use of the NIMC

There is low compliance with several safety features of the NIMC and in some elements significant variation in the level of compliance between jurisdictions.

Recommendation 1: The Health Services Medication Expert Advisory Group consider mechanisms for improving the use of NIMC safety features with poor levels of compliance that carry a high risk for causing patient harm and detailed in Table 3.

Table 3: NIMC Safety features with poor compliance

Safety feature	2009 audit result
1. Patient identification	31% complete
2. Patient weight	23% documented (total) 76% documented (paediatric)
3. ADR documentation	63% complete
4. Warfarin - indication - education provided to patient	 61% documented 10% documented
5. Sustained release box	46% ticked for SR products
6. Designated medicine name, route and dose and frequency sections.	51% adult medication orders unclear 39% paediatric medication orders unclear 35% PRN frequency error rate (Could be a particular focus of attention) 23% medication orders contained one or more error prone abbreviations*
7. Paediatric dose calculation box	25% paediatric doses calculated documented
8. Intermittent medicines	590% administration section boxed correctly
9. Indication box	15% indications documented. Poor compliance across all jurisdictions
10. Pharmacy annotations	30% of medication orders were annotated by pharmacists
11. Pharmaceutical review	40% of NIMCs had a pharmaceutical review documented

** Error prone abbreviations, particularly the use of s/l for routes, mcg for doses, q4h and od for frequency remain at an unacceptably high level.*

6.2 Possible focuses for future NIMC national audits

There were a number of issues relating to the audit process that have been identified.

2: It is recommended that the Health Services Medication Expert Advisory Group consider the recommendations on the conduct of future NIMC national audits. (See Table 4)

Table 4: Recommendations for future audits

Issue	Assessment and background	Recommendation
1. Inter-rater reliability of auditors	Some of the results of 2009 audit varied significantly between jurisdictions. This may have been a result of variations in prescriber behaviour but may also have been due to misinterpretation by the auditors.	Review the training of auditors and revise training materials including definitions and examples. Consider collaborating with NPS to develop on-line education program for auditors. Ensure completion of training prior to undertaking audits.
2. Inability to compare 2009 data with post pilot data	Unmatched sites. It is not known if any of the sites in 2009 participated in the 2006 post implementation of NIMC pilot.	Consider specifically approaching 22 original pilot sites for 2011 audit and using similar audit tools to those used in 2006
3. Inability to compare 2009 data with previous data	Definitions of errors have changed. The introduction of unacceptable abbreviations has increased the number of "unclear" orders significantly. Similarly definitions have changed for ADR documentation and patient identification.	Ensure reporting of missing prescribing details is reported and discussed separately.
4. Duplication errors	It is unknown if the duplication errors are regular and PRN orders for the same drug or two regular orders on separate medication charts. The clinical significance of these errors is unknown.	Further explore these types of errors
5. PRN dosing and frequency errors	Data were missing for PRN maximum doses and issues raised about denominators	Once daily doses do not require hourly dosing to be specified. A specific audit on PRN orders be undertaken.
6. Errors associated with "unclear" orders	HSMEAG to consider if it is important to separate errors due to no dose, route or frequency ordered from use of error prone abbreviations	Report errors with no dose, route or frequency ordered separately from use of error prone abbreviations
7. Use of ADR alert stickers	Only 30% compliance with this element.	Consider the value of auditing this element.
8. Availability of warfarin guidelines	Very low compliance with this element at 12%. Not used in several jurisdictions.	Consider the value of auditing this element.

7 Conclusion

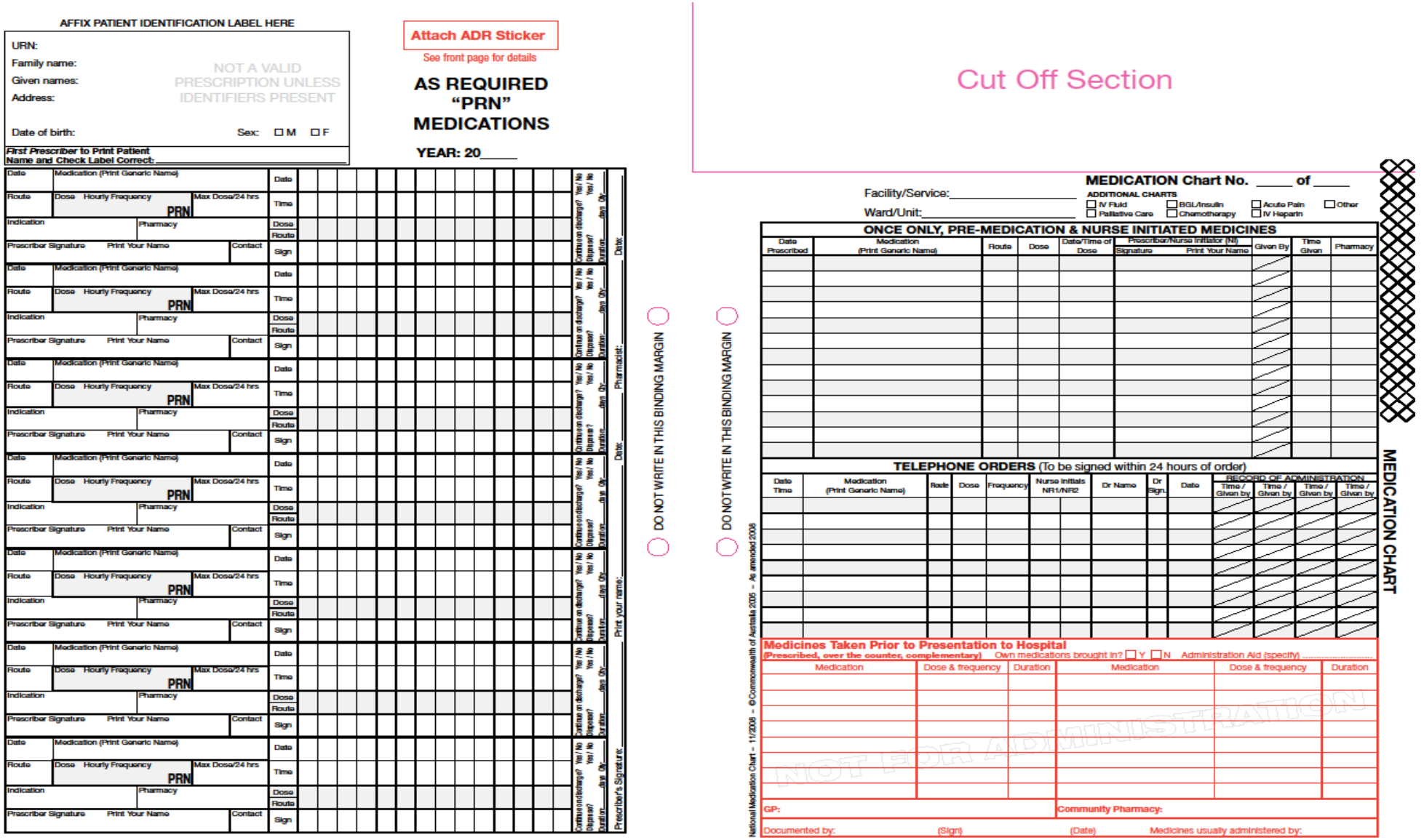
The available NIMC audit data in 2009 (from five jurisdictions only) may not be totally representative of prescribing practices. However, compared with the 2007 data, there appears to have been an improvement in the safety of prescribing behaviour in many areas. There is also continued improvement compared with the 2006 post-NIMC implementation pilot data.

However the 2009 audit showed that there are still opportunities for further reducing the risk of medication errors, particularly those associated with the communication of prescribing decisions to other medical, nursing and pharmacy staff. Only in one jurisdiction was there a consistent improvement in the completeness and clarity of orders.

The audit process continues to highlight areas of improvements in patient safety and identify specific areas on which some or all jurisdictions may wish to focus medication safety strategies in 2011.

National Inpatient Medication Chart

Appendix 1



AFFIX PATIENT IDENTIFICATION LABEL HERE

URN:
Family name:
Given names:
Address:
Date of birth: Sex: ☐ M ☐ F

NOT A VALID PRESCRIPTION UNLESS IDENTIFIERS PRESENT

First Prescriber to Print Patient Name and Check Label Correct: _____

Attach ADR Sticker

See front page for details

AS REQUIRED "PRN" MEDICATIONS

YEAR: 20____

Date | Medication (Print Generic Name) | Route | Dose | Hourly Frequency | Max Dose/24 hrs | PRN | Indication | Pharmacy | Prescriber Signature | Print Your Name | Contact | Date | Time | Dose | Route | Sign | Continue on discharge? Yes / No | Dispense? Yes / No | Duration ____days Qty____

Date: _____ Pharmacist: _____ Print your name: _____ Prescriber's Signature: _____ Date: _____

DO NOT WRITE IN THIS BINDING MARGIN

DO NOT WRITE IN THIS BINDING MARGIN

Cut Off Section

MEDICATION Chart No. _____ of _____

Facility/Service: _____

Ward/Unit: _____

ADDITIONAL CHARTS ☐ IV Fluid ☐ Palliative Care ☐ BGL/Insulin ☐ Chemotherapy ☐ Acute Pain ☐ IV Heparin ☐ Other

ONCE ONLY, PRE-MEDICATION & NURSE INITIATED MEDICINES

Date Prescribed	Medication (Print Generic Name)	Route	Dose	Date/Time of Dose	Prescriber/Nurse Initiator (NI) Signature	Prescriber/Nurse Initiator (NI) Print Your Name	Given By	Time Given	Pharmacy

TELEPHONE ORDERS (To be signed within 24 hours of order)

Date Time	Medication (Print Generic Name)	Route	Dose	Frequency	Nurse Initials NR1/NR2	Dr Name	Dr Sign.	Date	RECORD OF ADMINISTRATION Time / Given by	Time / Given by	Time / Given by	Time / Given by

Medicines Taken Prior to Presentation to Hospital

(Prescribed, over the counter, complementary) Own medications brought in? ☐ Y ☐ N Administration Aid (specify) _____

Medication	Dose & frequency	Duration	Medication	Dose & frequency	Duration

NOT FOR ADMINISTRATION

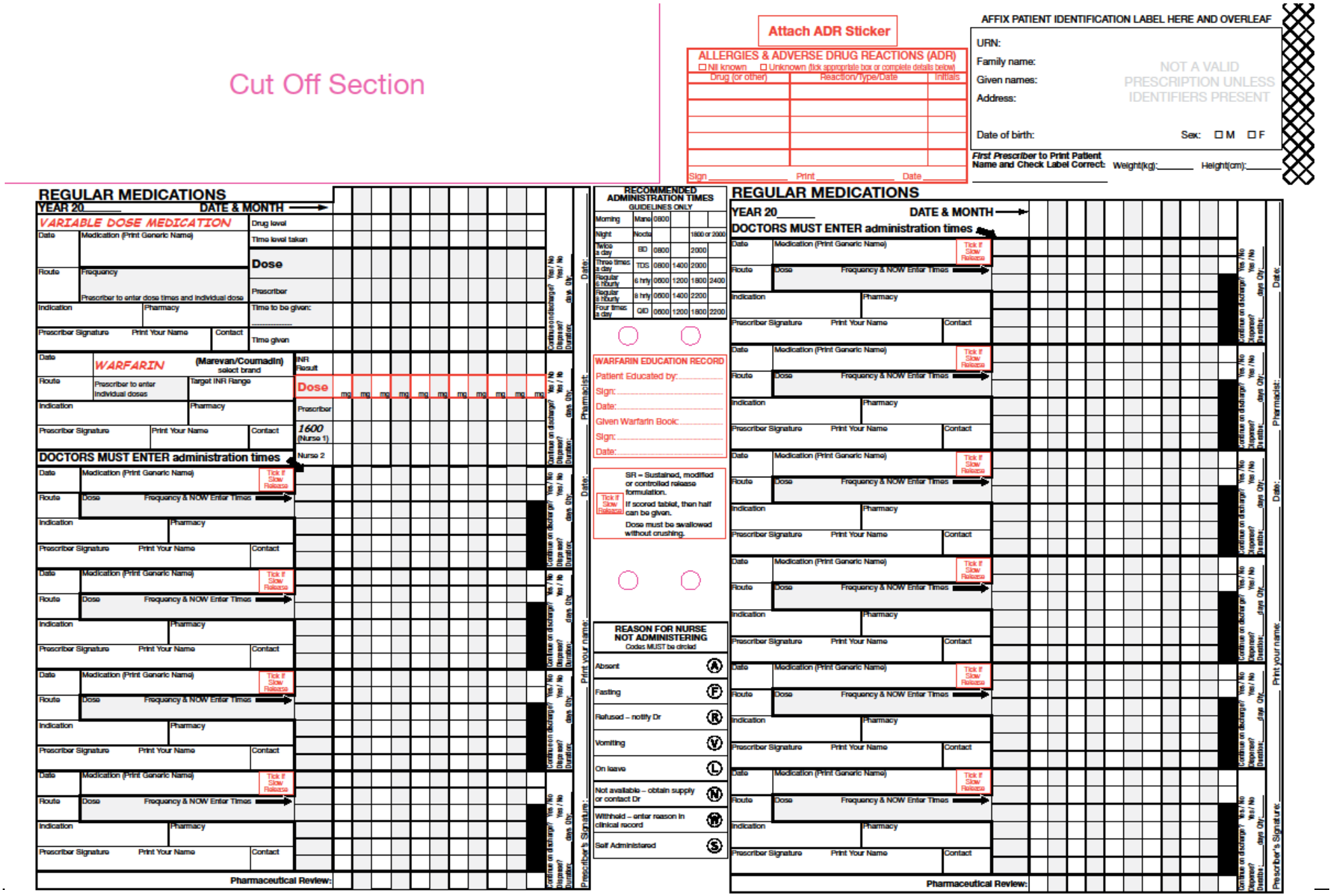
GP: Community Pharmacy:

Documented by: (Sign) (Date) Medicines usually administered by:

National Medication Chart – 11/2006 – © Commonwealth of Australia 2006 – As amended 2008

MEDICATION CHART

Cut Off Section



Attach ADR Sticker

ALLERGIES & ADVERSE DRUG REACTIONS (ADR)
☐ Nil known ☐ Unknown (tick appropriate box or complete details below)

Drug (or other)	Reaction/Type/Date	Initials

Sign _____ Print _____ Date _____

AFFIX PATIENT IDENTIFICATION LABEL HERE AND OVERLEAF

URN:
Family name:
Given names:
Address:
Date of birth: Sex: ☐ M ☐ F

NOT A VALID PRESCRIPTION UNLESS IDENTIFIERS PRESENT

First Prescriber to Print Patient Name and Check Label Correct: Weight(kg):_____ Height(cm):_____

REGULAR MEDICATIONS
YEAR 20____ DATE & MONTH →

VARIABLE DOSE MEDICATION
Date | Medication (Print Generic Name) | Drug level | Time level taken
Route | Frequency | Dose
Prescriber to enter dose times and individual dose | Prescriber
Indication | Pharmacy | Time to be given:
Prescriber Signature | Print Your Name | Contact | Time given

WARFARIN (Marevan/Coumadin) select brand
Date | Route | Prescriber to enter individual doses | Target INR Range | INR Result | Dose | Prescriber
Indication | Pharmacy
Prescriber Signature | Print Your Name | Contact
1600 (Nurse 1) | Nurse 2

DOCTORS MUST ENTER administration times
Date | Medication (Print Generic Name) | Tick if Slow Release
Route | Dose | Frequency & NOW Enter Times →
Indication | Pharmacy
Prescriber Signature | Print Your Name | Contact

Pharmaceutical Review:

Continue on discharge? Yes / No | Dispense? Yes / No | days Qty | Duration | Date: | Pharmacist: | Print your name: | Prescriber's Signature:

RECOMMENDED ADMINISTRATION TIMES
GUIDELINES ONLY

Morning	Mane	0800			1800 or 2000	
Night	Nocte					
Twice a day	BD	0800		2000		
Three times a day	TDS	0800	1400	2000		
Regular 6 hourly	6 hrly	0600	1200	1800	2400	
Regular 8 hourly	8 hrly	0600	1400	2200		
Four times a day	QID	0600	1200	1800	2200	

WARFARIN EDUCATION RECORD
Patient Educated by:
Sign:
Date:
Given Warfarin Book:
Sign:
Date:

Tick if Slow Release
SR = Sustained, modified or controlled release formulation.
If scored tablet, then half can be given.
Dose must be swallowed without crushing.

REASON FOR NURSE NOT ADMINISTERING
Codes MUST be circled

Absent	(A)
Fasting	(F)
Refused – notify Dr	(R)
Vomiting	(V)
On leave	(L)
Not available – obtain supply or contact Dr	(N)
Withhold – enter reason in clinical record	(W)
Self Administered	(S)

REGULAR MEDICATIONS
YEAR 20____ DATE & MONTH →
DOCTORS MUST ENTER administration times
Date | Medication (Print Generic Name) | Tick if Slow Release
Route | Dose | Frequency & NOW Enter Times →
Indication | Pharmacy
Prescriber Signature | Print Your Name | Contact

Pharmaceutical Review:

Continue on discharge? Yes / No | Dispense? Yes / No | days Qty | Duration | Date: | Pharmacist: | Print your name: | Prescriber's Signature:

NIMC National Audit 2009 Expression of interest invitation

AUSTRALIAN COMMISSION ON SAFETY AND QUALITY IN HEALTH CARE

2009 National Audit of the National Inpatient Medication Chart

Expressions of interest invited

The Australian Commission on Safety and Quality in Health Care (the Commission) is seeking expressions of interest from suitably experienced and qualified organisations to coordinate and report results of a national audit of the National Inpatient Medication Chart.

The Commission is responsible for national version control of the National Inpatient Medication Chart (NIMC). In 2008 an NIMC quality improvement project identified national auditing as an essential part of:

- ensuring the safety features of the NIMC are optimised;
- assisting hospitals to comply with the Ministerial requirement to use the NIMC:
- informing continuous quality improvement of the NIMC;
- reporting back to facilities and jurisdictions on use of the NIMC and its safety features.

Scope of audit

It is intended that:

- all public and private hospitals using the NIMC 2009 in all jurisdictions will participate;
- the NSW Therapeutic Advisory Group Indicators for Quality Use of Medicines in Australian Hospitals Indicator 3.1 sampling strategy* will be used as the sample selection basis;
- greater than 22,000 medication charts are expected to be audited as part of the project.

Deliverables

The project will deliver the following:

- audit tool (including data elements consistent with the National NIMC Audit Tool) and worked examples;
- audit guidance document;
- audit support such as:
    - frequently asked questions – that are able to be updated regularly;
    - a telephone support for jurisdictional representatives;
    - moderate an online forum hosted by the Commission to assist sites with queries;
- one audit train the trainer session for jurisdictional representatives (in addition to supporting online audit training documents);
- audit reports to facility, jurisdictional and national levels, with ward/unit level data available for sites to utilise locally;
- an article for publication to a peer reviewed journal (publication / presentations arising from the national audit of the NIMC will have authorship shared between the successful organisation and the Commission).

Relationships

The **Commission** will:

- fund the NIMC national audit;
- provide details of jurisdictional liaison staff;
- promote the national audit;
- host national audit materials and information on its website.

Jurisdictions will:

- be the primary contact for hospital auditors;
- ensure data quality for inclusion in the audit;
- provide data as requested by the contracted audit manager.

Participating hospitals will:

- nominate a local representative responsible for the audit and undertake the training of local auditors;
- use their own staff to audit medication charts using the audit tools provided to ensure consistent auditing outcomes;
- provide data to jurisdictional liaison staff in the agreed form.

Timeline is as follows:

- audit preparation in place prior to August 2009;
- auditing throughout August 2009;
- status report back by end of September 2009 (e.g. response rates);
- final report back by December 2009.

Expressions of interest

Expressions of interest will be emailed to mail@safetyandquality.gov.au by COB 1 May 2009. The brief 3 to 4 page proposal will include the proposed:

- audit methodology (including feedback on the audit process);
- audit data elements consistent with the National NIMC Audit Tool and including additional elements from the NIMC paediatric chart;
- management of data including receipt, loading and analysis and appropriate security arrangements.

Further information on the Commission, the National NIMC audit tool and the NIMC are available from the Commission's web site at www.safetyandquality.gov.au

Contact for the expression of interest is Graham Bedford on (02) 9263 3723 or graham.bedford@safetyandquality.gov.au

**Sampling strategy*

Number of beds in hospital	**Sample size**
150 or more	20% of current inpatients
30-149	30 current inpatients
Less than 30	All current inpatients

National Inpatient Medication Chart Audit Tool

National Inpatient Medication Chart Prescribing Audit

STATE | HOSPITAL | UR NO. | ○ Male ○ Female GENDER | REVIEWER 1

WARD | BED NO. | AUDIT DATE / / | DATE OF BIRTH / / | REVIEWER 2

CHART TYPE ○ NIMC ○ NIMC Long Stay ○ NIMC Paediatric ○ NIMC Paediatric Long Stay

1. Patient Identification & Weight

1.1 Total current *Medication Charts* (ie. charts in use) ____

1.2 *Patient ID* complete on **all** pages (incl. hand-printed name if label used) ____ Y N

1.3 *Weight* documented on **a** *Medication Chart* (*Paeds* must be **all** charts) ____ Y N

2. Adverse Drug Reaction (ADR) Details

2.1 *ADR* documentation complete on **all** charts (incl. *NKDA / Unknown*) ____ Y N

2.2 Patient has previous *ADR* ____ Y N Unk
(If *No*, go to Q. 3.1)

2.3 Similar class of medication prescribed ____ Y N
(Document *Drug, Reaction & Represcribed Drug* here)

2.4 If previous *ADR*, do **all** pages have *ADR Alert Stickers* in place ____ Y N

3. Medication History

3.1 *Medication History* documented on *Medication Chart* ____ Y N

3.2 If 'No', is a *Medication History* cross-referenced on *Medication Chart* ____ Y N

3.3 *Medication Action Plan (MAP) Form* in 'end of bed' folder ____ Y N
(If *No*, go to Q. 4.1)

3.4 *Allergies / ADR* box completed on *MAP Form* ____ Y N

3.5 No. medicines taken prior to presentation to hospital recorded on *MAP Form* ____

3.6 No. medicines with *Dr's Plan on Admission* completed on *MAP Form* ____

3.7 No. medicines with *Reconcile* column ticked on *MAP Form* ____

3.8 More than one source indicated on *MAP Form* ____ Y N

4. Warfarin

4.1 *Warfarin Guidelines* at end of patient's bed or with *Medication Chart* ____ Y N

4.2 No. times patient prescribed warfarin (*Warfarin & Regular Order* sections) ____
(If *Nil / Zero*, go to Q. 5.1)

4.3 No. *Target INR* ranges documented if prescribed in *Warfarin* section ____

4.4 No. *Target INR* ranges documented if prescribed in *Regular* section ____

4.5 *Warfarin Education* recorded ____ Y N

5. Variable Dose

5.1 No. *Variable Dose* medications (*Variable Dose & Regular Order* sections) ____
(If documented in *Regular* section, write *Drug Name & Frequency* here)

6. Sustained Release

6.1 No. *Sustained Release* medications ordered (*Regular Order* section) ____
(If *Nil / Zero*, go to Q. 7.1)

6.2 No. *Sustained Release* medications with *SR* box ticked ____

7. Intermittent Medications

7.1 No. *Intermittent* medications ordered (ie. weekly, fortnightly, twice weekly) ____
(If *Nil / Zero*, go to Q. 8.1)

7.2 No. *Intermittent* medications ordered & 'boxed' ____

8. Duplicate Orders

8.1 No. Duplicated orders ____
(Record *Duplications* here)

9. Pharmaceutical Review

9.1 *Pharmaceutical Review* occurred (ie. initial at bottom of chart) ____ Y N

Comments: ____

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National Inpatient Medication Chart Audit Tool

10. Prescribing and Administration

Legend

Drug Order:
R = Regular
P = PRN
S = Stat/Phone/Once Only
V = Variable Dose
W = Warfarin

Drug Name:
U = Unclear
T = Trade
C = Clear

Route / Dose:
C = Clear
M = Missing
U = Unclear
I = Incorrect

Frequency:
C = Clear
M = Missing
U = Unclear
I = Incorrect
NA = Not Applicable

Others:
Y = Yes
N = No

UR NO.

Definitions: Error Prone Abbreviations

mcg, µg, ug = microgram U or u = unit qd or QD = every day o.d. or OD = once daily	SC, S/C = subcutaneous SL, S/L = sublingual o (degree symbol) = hourly frequency No leading zero before a decimal point (eg .5mg) = 0.5mg Trailing zero after decimal point (eg 1.0mg) = 1mg

Order No.	Drug Order	Drug Name	Route	Dose	Frequency	Dose Calc'n Documented	Dose Calc'n Documented Correctly	Error Prone Abbrev'ns Used	Indication Documented	Pharm. Annot.	Pres. Signed	Pres. Clear	Freq. Matches Admin Time	Drug Ceased	Ceased Correctly	Doses Required	Doses Admin	If PRN, Max Dose doc.
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA
						Y N NA	Y N NA	Y N	Y N NA	Y N	Y N	Y N	Y N NA	Y N	Y N NA			Y N NA

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