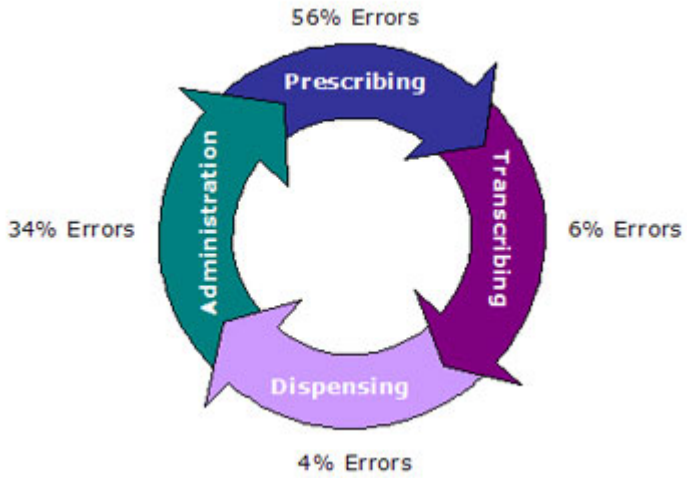
National Inpatient Medication Chart
Victorian Evaluation August 2007

Background

In a joint communiqué dated April 2004, Australian Health Ministers committed to a standard National Inpatient Medication Chart (NIMC) to reduce the harm to patients from medication errors.

Rationale

Errors can occur at any point of the medication management cycle, however the majority occur during prescribing (Bates et al, JAMA, 1995). Evidence indicates that errors may be reduced with better understanding of key safety principles and standardisation.



Development of the NIMC

The Australian Council for Safety and Quality in HealthCare, (now reformed as the Australian Commission on Safety and Quality in Health care), established a multidisciplinary NIMC oversight committee, comprised of members from each state. The NIMC was finalised and piloted in thirty-one sites across Australia in 2005. Final amendments were made following the feedback from the pilot sites.

Implementation of the NIMC in Victoria

Seven workshops spanning rural, regional and metropolitan areas, were conducted by the Quality Use of Medicines (QUM) Program, Quality and Safety (Q&S) Branch, Department of Human Services (DHS) Victoria between November 2005 and February 2006. A toolkit was developed comprising materials to support the education, implementation and evaluation of the NIMC. Registers to monitor both the progress for implementation and to record proposed changes for the NIMC were developed. The toolkit and registers were made available on the Victorian Medicines Advisory Committee (VMAC) website (http://www.health.vic.gov.au/vmac/nimc.htm). Implementation of the NIMC was completed in Victoria by the end of January 2007. This was consistent with national timeframes.

A standardised audit form and excel spreadsheet were developed. It was recommended that health services conduct a pre implementation audit and a post implementation audit, after three to six months initially and subsequently at annual intervals. In June 2007 a letter was sent to Victorian chief executive officers requesting that NIMC audit data be submitted to the QUM Program, Q&S Branch, DHS Victoria, by 13 July 2007. A follow up email was sent to project officers to encourage further submission of data.

Results

Evaluation data was submitted from twenty six rural and regional health services and eight metropolitan health services. Both pre and post implementation data was submitted from seven regional and rural sites and seven metropolitan sites. Pre and post implementation data was collated in an excel spreadsheet.

Limitations

- A total of fifty data elements were included in the audit form. However few health services collected data for all fifty elements. Therefore average values were calculated on the basis of the number of health services that had collected data for each element.
- The number of patients included in the audits varied between health services.
- The specialties included in the audit varied between health services.
- The timing of the post implementation audits varied from one month to twelve months post implementation. The average results were calculated for the latest audit conducted post implementation.
- The number of post implementation audits varied between one and four.

Metropolitan Health Services (7) (Appendix 1)

Section 2: Patient identification, weight and medication history

Patient identification and number of medication charts in use was reasonably well documented, with averages of 86 per cent and 66 per cent respectively. This improved slightly by 1 per cent and 3 per cent respectively, post-implementation.

There is scope for improvement in documentation of weight, which was completed in 8 per cent of cases pre and post implementation.

Section 3: Adverse drug reaction (ADR) details alerts and errors

Documentation of adverse drug reaction information overall improved markedly, with documentation of the drug and reaction improving by 7 per cent and 15 per cent respectively to 80 per cent and 42 per cent. Documentation of an ADR (or ‘no known allergy’) improved from 45 per cent to 81 per cent and documentation of the clinician’s signature on the ADR history improved by 42 per cent to 90 per cent. There was also a reduction in prescription of drug to which a patient had a previous allergy, by 2 per cent from 6 per cent to 4 per cent.

Sections 4-6: Prescribing anomalies

The areas that showed the greatest improvement included the ‘Slow Release’ box being ticked (increased 23 per cent), documentation of indication for regular orders (increased 35 per cent) and ‘prn’ orders (increased 41 per cent) the clarity of the prescriber’s name (increased 28 per cent). Completion of administration times by the prescriber increased

by 20 per cent to 33 per cent. There was an increase in the correlation between administration and frequency from 83 per cent to 91 per cent.
There were small improvements in the prescription of dose, route and frequency for regular medications, but frequencies and maximum doses were slightly less clear post implementation (-9 per cent and –3 per cent respectively).

Section 8: Warfarin dosing and administration

The documentation of the indication and target range for warfarin increased by 26 per cent and 36 per cent to 53 per cent and 73 per cent respectively.

Section 9: Clinical Pharmacist Activity

The annotation of orders by a pharmacist decreased by 1 per cent and the number of days that clinical pharmacist review was annotated on the chart increased by 9 per cent to 34 per cent.

Rural and regional hospitals (7) (Appendix 2)

Section 2: Patient identification, weight and medication history

Documentation of patient identification decreased over the range of parameters.

Section 3: Adverse drug reaction (ADR) details alerts and errors

Documentation of an ADR (or no known ADR) improved by 6 per cent to 67 per cent and signature of the ADR history by the prescriber increased by 34 per cent to 38 per cent. Changes in documentation of the drug and reaction showed minimal changes (-1 per cent and 1 per cent respectively).

Sections 4-6: Prescribing anomalies

The areas that showed the greatest improvement included 'Slow Release' box ticked (32 per cent), number of duplicated orders (-20 per cent), clarity of dose (35 per cent), route (6 per cent), frequency (31 per cent), documentation of indication (17 per cent), number of medication orders signed by the prescriber (11 per cent), clarity of the prescriber's signature (28 per cent) and entry of administration times by the prescriber (48 per cent). Documentation using trade name only also reduced by –1 per cent to 35 per cent. Documentation of the following parameters reduced name of medication (-2 per cent), administration times correlating with frequency (-1 per cent), and for prn medication: documentation of frequency (-3 per cent), indication (-3 per cent) and maximum dose (-6 per cent).

Section 8: Warfarin dosing and administration

Documentation of the indication and target range for warfarin increased by 22 per cent and 49 per cent respectively, to 42 per cent and 59 per cent.

Section 9: Clinical Pharmacist Activity

Annotation of the medication chart by the pharmacist increased by 6 per cent to 32 per cent.

Discussion

Patient identification improved for metropolitan health services. Improvement in patient identification reduces the potential for 'wrong patient error'. Patient identification, documentation of patient weight, documentation of the number of charts in use and documentation of a medication history on the NIMC showed a decrease in rural and regional health services. This is difficult to explain as the NIMC provided sections to enable these parameters to be completed, suggesting that the change was due to a change in practice, rather than a system based change.

Documentation of weight assists in calculating and checking doses, especially for drugs with a narrow therapeutic index, such as aminoglycosides and chemotherapy. Documentation of the medication history at the point of prescribing may assist in facilitating accurate medication reconciliation. Of note, some hospitals have developed more comprehensive 'medication reconciliation' forms which may account for low values in some cases.

Improvements in documentation of adverse drug reactions occurred in all health services. Annotation of both the drug and the reaction improved in metropolitan areas, but changed little in regional and rural areas. Signature of the adverse drug reaction history by the prescriber showed a marked improvement in all sites. Improvement in documentation of adverse drug reaction details reduces the potential for a patient to receive a medication to which he or she is allergic and assists the doctor in assessing the benefits and risks of re-prescribing a drug in the case whereby the reaction was mild and there are limited therapeutic alternatives. In all sites, re-prescription of a medication to which the patient was allergic decreased.

Indication of whether a medication was sustained release, documentation of indication for regular orders and 'prn' orders, clarity of the prescriber's name and completion of the administration times by the prescriber, clarity of dose, route and frequency all improved across all sites. Use of generic prescribing also improved at all sites.

There is scope for improvement in documentation of frequencies and maximum doses for 'prn' medications in metropolitan, regional and rural areas.

A reduction in prescribing anomalies reduces the potential for medication errors. Use of generic prescribing may reduce medication errors involving duplication of a prescribed item due to lack of familiarity with brand names. Completion of the administration times by the prescriber increased in all sites, which in most cases, represented a marked culture change. This practice may reduce the potential for errors resulting from transcription errors or misinterpretation of instructions, which was evidenced in metropolitan areas, by an eight per cent improvement in correlation between prescribing instructions and administration times, however this parameter showed little change in regional and rural sites. The increased clarity of the prescriber contact details may assist in reducing the time taken to contact the prescriber to confirm or clarify prescription details.

Documentation of the indication and target range for warfarin increased markedly in all sites. Completion of these details assists the prescriber in making decisions regarding the appropriate dose and duration of this high-risk medication.

Annotation of the medication chart by a pharmacist showed a general improvement. Annotation of the medication chart by a pharmacist assists in clarifying whether the chart has already been reviewed and by whom, to assist in both auditing and communication.

Concerns expressed by clinicians regarding the NIMC included concerns about space, necessitating multiple charts to be written per patient. There were also concerns about the need for separate ancillary charts, which was felt to increase the risk of dose omission. It has been suggested that there needs to be increased room in the regular and 'prn' medication sections. The 'number of charts in use' section is in some cases underutilised, which becomes an issue in the case where multiple charts are used per patient.

Some former charts had a specific section for ceasing medication, which is not included on the NIMC, perhaps explaining why the adherence to hospital policy regarding cease date declined post implementation of the NIMC. The relocation of 'prn' medication to the back of the chart raised concerns of duplication or omission. The audit results suggested that there was scope for improved documentation of maximum doses and frequency of 'prn' medicines.

Some of the concerns related to changes in practice as opposed to potential increased risks due to the design, for example the requirement for completion of the administration times by prescribers raised the need for training in administration times and the requirement for handwritten endorsement of patient identification labels declined post implementation of the NIMC.

In some hospitals the medication reconciliation section of the NIMC was underutilised. This occurred especially when a separate dedicated medication form was used by the health service. This section may therefore need to be reviewed.

Some health services have commented that the distinction between the variable dose section, the warfarin section and the regular medication section leads to omission of warfarin and variable doses. It has been suggested that either the colour is changed from red, or the position is relocated.

The NIMC is not specifically designed to accommodate variable dose insulin prescribing and administration. The NIMC national oversight committee will establish a steering group to address and resolve this issue.

Conclusions

The results have demonstrated that there have been some marked improvements in documentation of certain prescribing parameters, resulting from the design of the NIMC. Feedback from a range of rural, regional and metropolitan health services has reinforced these results. There is increasing acceptance that an increase in the safety of systems improves the safety of patient outcomes. Whilst not directly measured during this audit process the results suggest that the potential for specific medication errors may have been reduced. However the results also indicate that further education is required to improve the potential safety benefits of the existing chart design. In addition the results and feedback need to be evaluated by the NIMC oversight committee in order that the design of the chart may be optimised to further reduce the risk of medication errors. The NIMC oversight committee is committed to the development of a suite of ancillary charts to complement the implementation of the NIMC and to the establishment of a national insulin prescribing and administration steering group to address concerns in this area.

Appendix 1: Metropolitan Health Services-NIMC Audit Results

	Data element	Number of hospitals that collected the data element	Pre imp average	Post imp average	Variance
2.3	No. of medication chart pages with **complete** ID (handwritten or label)	4	86%	87%	1%
2.6	Weight recorded	1	8%	8%	0%
2.7	No. of charts with the 'charts in use' section completed	1	66%	69%	3%
3.1	NKDA ticked or written or ADR documented	2	45%	81%	37%
3.2	Clinician signature for ADR history	1	48%	90%	42%
3.5	No. of ADR medication names documented	5	73%	80%	7%
3.6	No. of ADR reaction details documented	5	27%	42%	15%
3.10	Similar class of medication prescribed (please **specify** drug in section below)		6%	4%	-2%
4.1	No. of medications with trade name only (ALL orders)	5	29%	28%	-1%
4.2	No. of medications with name clearly written (ALL orders)	5	93%	95%	2%
4.4	No. of sustained release medications with SR box ticked	5	29%	53%	23%
4.5	No. of duplicated orders (please **specify** drug in section below) (ALL orders)	2	1%	2%	1%
4.6	No. of medications with **route** present, clear and appropriate (ALL orders)	5	94%	96%	2%
4.7	No. of medications with **dose** present, clear and correct (ALL orders)	6	89%	93%	4%
4.8	No. of times *'od'* used as frequency (regular orders only)	2	5%	4%	-1%
4.9	No. of medications with **frequency** clear and correct (reg orders only, excl *'od'*)	5	96%	97%	1%
4.10	No. of orders with administration times entered by prescriber (regular orders)	5	13%	33%	20%
4.11	No. of administration times correlating with frequency	6	83%	91%	8%
4.12	No. of orders with an indication documented (regular orders only)	3	2%	37%	35%
4.14	No. of orders ceased according to hospital policy	4	54%	27%	-28%
5.1	No. of PRN frequencies recorded *(i.e. morphine 2.5mg 4th hourly PRN)*	6	86%	85%	-1%
5.2	No. of clearly written PRN frequencies *(i.e. morphine 2.5mg 4 hourly PRN)*	5	84%	75%	-9%
5.3	No. of PRN orders with an indication documented	6	6%	47%	41%

5.4	No. of PRN orders with a max. dose documented	7	26%	24%	-2%
6.1	No. of medication orders signed by prescriber	7	84%	93%	9%
6.2	No. of orders where prescriber name is **CLEARLY** written	5	46%	73%	28%
8.4	Indication for Warfarin documented	4	27%	53%	26%
8.5	Target INR documented	5	36%	73%	36%
9.1	No. of orders with pharmacist annotation including supply	2	60%	59%	-1%
9.3	No. of days with clinical pharmacist review ie initial at bottom of chart	5	25%	34%	9%

Appendix 2: Regional and rural health services – NIMC audit results

	Data element	Number of hospitals that collected the data element	Pre imp average	Post imp average	Variance
2.3	No. of medication chart pages with **complete** ID (handwritten or label)	5	72%	54%	-18%
2.5	No. of ID labels with printed patient name below	5	54%	30%	-24%
2.6	Weight recorded	4	23%	15%	-8%
2.7	No. of charts with the 'charts in use' section completed	4	63%	39%	-24%
2.8	Medication History documented on front of chart/ referenced	2	8%	5%	-3%
3.1	NKDA ticked or written or ADR documented	4	62%	67%	6%
3.2	Clinician signature for ADR history	3	5%	38%	34%
3.5	No. of ADR medication names documented	7	86%	85%	-1%
3.6	No. of ADR reaction details documented	7	44%	45%	1%
3.8	No. of pages with ADR alert stickers in place	5	35%	25%	-10%
3.9	Patient wearing ADR bracelet	4	57%	56%	-1%
3.10	Similar class of medication prescribed (please **specify** drug in section below)	5	9%	8%	-1%
4.1	No. of medications with trade name only (ALL orders)	7	37%	35%	-1%
4.2	No. of medications with name clearly written (ALL orders)	7	95%	93%	-2%
4.4	No. of sustained release medications with SR box ticked	5	22%	54%	32%
4.5	No. of duplicated orders (please **specify** drug in section below) (ALL orders)	5	21%	1%	-20%
4.6	No. of medications with **route** present, clear and appropriate (ALL orders)	6	77%	83%	6%
4.7	No. of medications with **dose** present, clear and correct (ALL orders)	7	62%	97%	35%
4.8	No. of times *'od'* used as frequency (regular orders only)	7	8%	10%	2%
4.9	No. of medications with **frequency** clear and correct (reg orders only, excl *'od'*)	7	97%	128%	31%
4.10	No. of orders with administration times entered by prescriber (regular orders)	4	21%	68%	48%
4.11	No. of administration times correlating with frequency	5	81%	80%	-1%
4.12	No. of orders with an indication documented (regular orders only)	5	7%	24%	17%

4.14	No. of orders ceased according to hospital policy	7	71%	63%	-8%
5.1	No. of PRN frequencies recorded *(i.e. morphine 2.5mg 4th hourly PRN)*	6	87%	84%	-3%
5.2	No. of clearly written PRN frequencies *(i.e. morphine 2.5mg 4 hourly PRN)*	7	72%	69%	-3%
5.3	No. of PRN orders with an indication documented	6	21%	30%	9%
5.4	No. of PRN orders with a max. dose documented	6	36%	30%	-6%
6.1	No. of medication orders signed by prescriber	6	82%	93%	11%
6.2	No. of orders where prescriber name is **CLEARLY** written	7	37%	65%	28%
7.3	No. of "Not administered" codes circled ie F, N, W	6	90%	88%	-2%
8.4	Indication for Warfarin documented	5	20%	42%	22%
8.5	Target INR documented	5	10%	59%	49%
8.8	Warfarin education recorded	3	0%	0%	0%
9.1	No. of orders with pharmacist annotation including supply	5	26%	32%	6%

Appendix 3: Summary of changes following the implementation of the NIMC

Parameter	Improved	Deteriorated
Chart details		
• patient identification	metropolitan	regional and rural
• charts in use	metropolitan	regional and rural
• weight		regional and rural
Adverse drug reactions		
• documentation	metropolitan, regional and rural	
• drug	metropolitan	
• reaction	metropolitan	
• signature by prescriber	metropolitan, regional and rural	
Prescribing anomalies		
• generic prescribing	metropolitan, regional and rural	
• name	metropolitan, regional and rural	
• SR ticked	metropolitan	regional and rural
• duplicated orders	rural and regional	metropolitan
• route	metropolitan, regional and rural	
• dose	metropolitan, regional and rural	
• frequency	metropolitan, regional and rural	
• indication	metropolitan, regional and rural	
• prn		metropolitan, regional and rural
• administration times by Dr	metropolitan, regional and rural	
• administration time=frequency	metropolitan	
Warfarin		
Indication	metropolitan, regional and rural	
Target range	metropolitan, regional and rural	
Pharmacist annotation	metropolitan, regional and rural	