NURSING HOME MEDICATION ERROR QUALITY INITIATIVE (MEQI)
JANUARY 1, 2004 TO SEPTEMBER 31, 2004

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I. NORTH CAROLINA SENATE BILL 1016

In 2003, the North Carolina General Assembly passed Senate Bill 1016 addressing medication management in the State's nursing homes and requiring an annual report of medication errors. The bill is entitled: **"An Act requiring nursing homes to establish a medication management advisory committee and specifying the duties of the committee and to require nursing homes to do certain things pertaining to the reduction of medication-related errors to increase patient safety."** The purpose of the bill is to promote the use of a medication management advisory committee in each nursing home that will oversee the reporting of medication errors and the evaluation of their cause. Follow up action by each facility's committee is intended to reduce subsequent errors and enhance patient safety.

II. PROGRAM OVERVIEW

In early 2004, the State of North Carolina contracted with the Cecil G. Sheps Center for Health Services Research (Sheps Center) at The University of North Carolina at Chapel Hill to implement a Medication Error Quality Initiative (MEQI) as part of Senate Bill 1016. The MEQI requires that each nursing home report, on an annual basis, information about medication errors that occur in its facility. The first annual report includes only nine months (January 1, 2004 to September 31, 2004) of medication error experience. Subsequent reports will include 12 months of errors. The reporting is mandatory for all nursing homes, but is limited to self-report. At this time no on-site review or follow-up to ensure the accuracy of these reports is required.

Definition of a Medical Error for the Purposes of the MEQI: The term "error" for the purposes of reporting includes errors that did not reach the patient, or did not harm the patient. This would include "near misses" where the error is caught before it occurs, and situations that could lead to error and dose omissions. The goal of such reporting is for facilities to examine how all errors occur and make appropriate changes in the medication process on site as problem areas are identified. **It is to be expected that a nursing home that is being careful about reporting and recording errors would have a significant number of errors to report, and we commend this effort.**

Prepared by the Cecil G. Sheps Center for Health Services Research
at The University of North Carolina at Chapel Hill
under contract for the North Carolina Department of Health and Human Services, Division of Facility Services.

III. DATA COLLECTION

With assistance from a statewide group of nursing home representatives, pharmacists and such agencies as the North Carolina Health Care Facilities Association (NCHCFA), the Sheps Center developed an **individual medication error data collection form**. This form was sent to all 386 licensed nursing homes in April 2004 as a suggested tool for tracking individual errors throughout the reporting period. Nursing Homes were surveyed regarding their technical capability. All but five nursing homes had Internet access and the ability to complete an online web-based form. The Sheps Center then developed an online **annual report form** for facilities to report their aggregate year-end information. The annual report contains the following information: the total number of medication-related errors for the preceding year, a listing of the types of medication-related errors, staff involved, a listing of the types of injuries caused and the number of injuries occurring, and the number of liability claims filed based on an adverse incident or reportable injury. Nursing homes were asked to list ten medications by generic name that were involved in errors at their site. To ensure that no identifying information about an individual patient was revealed, all information in the annual report is reported in a summary form at the facility level.

In late September, an **annual report packet** was mailed to each nursing home with instructions for completing the annual report, along with the form website address, and a randomized facility ID number. Sites were given one month to complete data entry. Facilities that did not respond were sent frequent reminders and updates to encourage data entry. At 15 days after deadline, a 100% response rate was achieved.

IV. NURSING HOMES' RESPONSE

North Carolina currently has 390 licensed nursing homes that fall under requirements for reporting. We received annual reports from 385 facilities, which is 100% of the nursing homes that were open at the beginning of the reporting period and functional during that time. This 100% participation rate is a credit to the nursing homes for making a strong effort to participate in the annual report process. One nursing home was excluded as it had been closed and evacuated due to hurricane flooding, and four new sites were excluded because they were not open the entire year (partial year reports were received from two new sites). This report includes only facilities regulated as "nursing homes" and excludes those regulated as part of hospitals or hospital systems, and those that are federally funded and regulated.

V. DATA SUMMARY AND DISCUSSION

All data were provided to the Sheps Center in summary form with no individual or patient level information. The purpose of the legislation and reporting of errors is to encourage the formation of the medication management advisory committee to study errors and address facility processes.

Table 1: Error Statewide Summary Nine Month Reporting Period

Total Number of Errors	**10,920**
Errors that did not reach/did not harm the patient	9,951
Errors that required monitoring / intervention	886
Errors causing temporary harm / require E.R.visit	82
Errors contributing to permanent harm	1
Mean number of errrors/facility	28.4
Median number of errors/facility	15.0
Number of errors per 100 nursing home beds	22.4

A. Total Errors

The total number of errors reported by the 385 nursing homes for the period January 1, 2004 to September 31, 2004 (9 months) was 10,920 **(Table 1)**. Again, these "errors" include those that actually occurred and "near misses" with the error being caught prior to reaching the patient. Out of the 10,920 statewide errors, only 886 led to a situation that required monitoring and intervention, and in only 82 of these error occurrences was there temporary harm or harm that required a trip to the emergency room. Only 1 error in the entire State contributed to permanent harm to a resident. In all other errors (9,951) either the error did not reach the patient or did not harm the patient.

The mean number of errors per nursing home was 28.4, the median was 15, and the number of errors per 100 nursing home beds was 22.4. The largest number of facilities, 95, reported between 6 and 10 errors per hundred beds, while only 30 facilities reported over 50 errors per 100 beds **(Figure 1)**. (The nursing homes in the State of North Carolina range in size from 24 to 360 beds, with an average bed size of 121 beds.) A significant range in the number of errors reported per site was observed: three sites reported no errors while one site reported more than 1,000 errors. The number of errors reported per month increased over the year as facilities became aware of the program **(Figure 2).** Information was also requested on the number of liability claims filed during the reporting period. Zero liability claims were reported.

Figure 1: Number of Errors per 100 Beds/ Nine Months

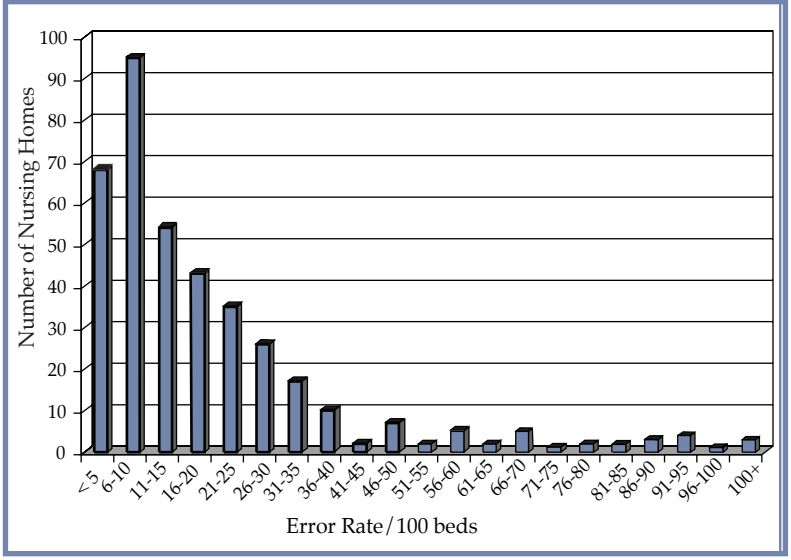
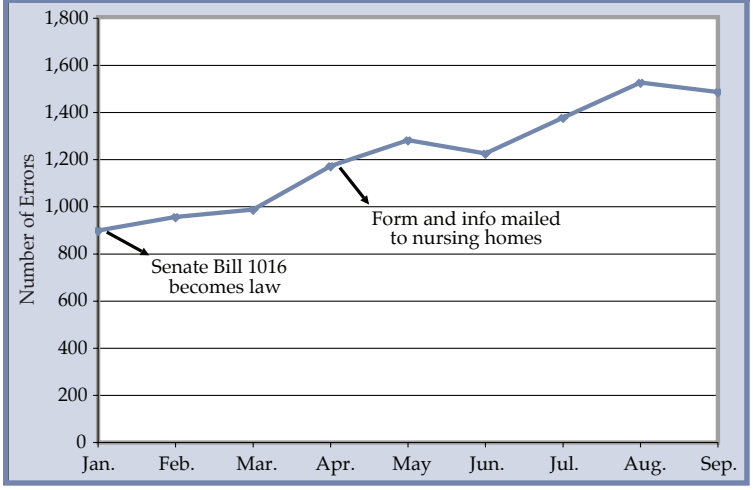


Figure 2: Errors Reported Per Month January 2004 to September 2004



To put the 10,920 errors in context with respect to the opportunities, we estimate the following: The average nursing home resident receives 8.1 medications administered 2.1 times per day (2003 National Medication Usage Study). For the approximately 47,000 nursing home beds in the State of North Carolina this translates to approximately 836,600 administrations of medication per day statewide. Our data has shown an average of 40.5 MEQI errors reported statewide per day, which is a very small percent (only .005%) of medication administration opportunities.

We anticipated a large variation in the number of errors reported among the individual sites during the first year due to a lack of consistency in how errors were defined or reported, and this was the case. Data suggest that sites with a large number of errors track a more significant number of "near misses" and are focused on recording and correcting these events. Sites with smaller numbers or no errors are less likely to have a process in place for recognizing errors, or have decided that certain common occurrences (missed dose, late dose, near misses) are not actually "errors". Over the next year, we hope to achieve greater consistency in the implementation of the operational definition of medication errors by working with the reporting facilities and encouraging them to work with one another on the results they are observing.

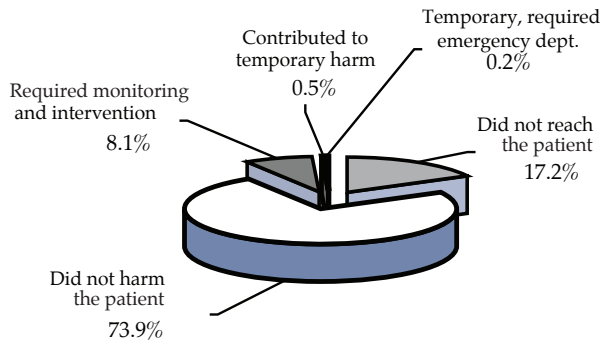
B. Cognitive Ability

Nursing homes were asked to indicate the number of errors that occurred among residents who were able to direct their own care. The definition provided of those who were *unable* to direct their own care would include those who are demented, comatose, or seriously vision or hearing impaired. Reports show that only 24.7% of errors occurred in those able to direct their own care and consequently, the vast majority of errors impacted patients who were unable to direct their own care.

C. Patient Outcomes

All errors were categorized with respect to the patient's outcome **(Figure 3)**. Most of the errors were categorized as either "**did not reach the patient"**, (N=1881; 17.2%), or "**did not harm the patient"** (N=8,070; 73.9%). "**Dose omissions**" were considered to have a potential impact on the patient, even if no harm occurred, and were placed in the category "**did not harm the patient"**. A total of 886 (or 8.1% of the errors) led to a situation where the resident "**required monitoring or intervention to preclude harm"**. A smaller number of errors (N=59; 0.5%) "**contributed to temporary harm to the resident"**. Twenty-three errors (0.2%) "**required a trip to the emergency department"**. Only one error out of the entire state was described as "**contributing to permanent harm to an individual".** No errors reported "**required interventions necessary to sustain life"** or "**contributed to a patient's death".**

Figure 3: Patient Outcomes



Additional categories: Contributed to Permanent Harm (1 error) , Intervention Necessary to Sustain Life (0 errors), and Contributed to Patient's Death (0 errors).

About 91.1% of the errors reported were in the first two categories, indicating that the error "**did not reach"** or "**did not harm the patient"**. This annual report includes self-report of all errors, which includes near misses, situations that could lead to error, and includes dose omissions. The goal of such reporting is for facilities to examine how all errors occur and make appropriate changes in the medication process on site as problem areas are identified.

D. Effects Observed

Respondents were also asked what effects the medication error had on the patient, and could choose multiple responses **(Table 2)**. Effects observed primarily fell in the category that "**no injury occurred"** (91.1% of responses), with "**inadequate effect of product"** being the second most common response (5.4%). There is internal consistency in that 91.1% of errors have "**no injury occurred"**, and 91.1% also fall under the category of "**did not reach"** or "**did not harm the patient"**.

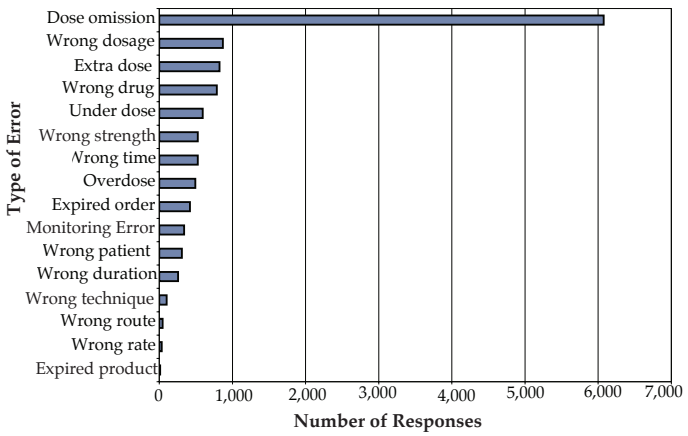
Table 2: Type of Effects

Type of Effects	No. of Responses	Percent Response
No injury occurred	10,280	91.1%
Inadequate effect of product	609	5.4%
Change in blood sugar	113	1.0%
Somnolence	63	0.6%
Cognitive change	51	0.5%
Constipation/diarrhea	42	0.4%
Nausea/vomiting	40	0.4%
Excessive side effects	37	0.3%
Respiratory distress	12	0.1%
Edema	12	0.1%
Fall	11	0.1%
Headache	6	0.1%
Visual disturbance	6	0.1%
Gastrointestinal bleed	3	0.0%
Hearing disturbance	0	0.0%
Aspiration	0	0.0%
Cardiac arrest	0	0.0%
Death	0	0.0%
TOTAL RESPONSES	**11,285**	**100.0%**

E. Type of Variance

The respondents were asked to categorize the type of variance (what kind of error was made), and were permitted to respond in more than one category **(Figure 4)**. The primary type of

Figure 4: Type of Errors



variance, with 49.7% of responses, was "**dose omission**". Another 22.6% reported variances related to dosage:

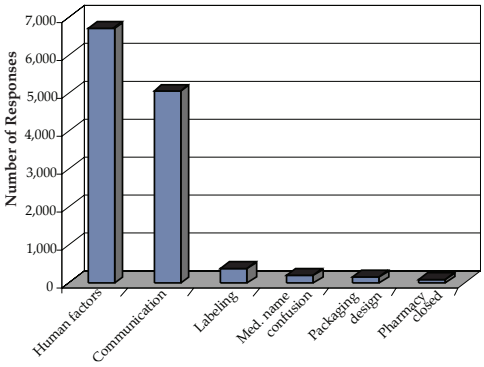
- "**wrong dosage - wrong form of medication**" (7.1%);
- "**extra dose – multiple doses given at one administration point**" (6.7%);
- "**under dose – too little medication given**" (4.8%); and
- "**overdose – too much medication given**" (4.0%).

These two general categories ("**dose omission**" and "**incorrect dose**") account for 72.3% of all responses, with the following categories also having over 4%:"**wrong drug**"(6.4%);"**wrong strength**" (4.3%); and **wrong time** (4.3%).

F. POSSIBLE CAUSES

The respondents were asked to identify possible causes of the errors, with multiple responses permitted (Figure 5). **"Human factors"** and "**communication**" were listed as the two main possible causes for the medication errors, at 53.3% and 40.2% respectively, which accounts for over 93% of the responses in this category. High staff turnover, heavy use of agency nurses, understaffing and lack of communication between staff on site are possible underlying factors in explaining communication and human factor issues. Areas that we anticipated might be associated with a large number of errors, and that technological and other interventions often address—such as "**medication name confusion**", "**labeling, packaging design**" and "**pharmacy closed**" — account for a very limited number of reported errors.

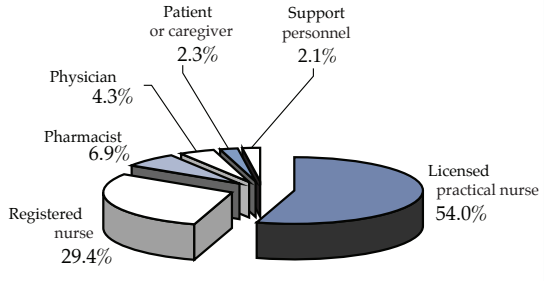
Figure 5: Possible Causes



G. PHASE IN MEDICATION PROCESS

Sites were asked to characterize the phase in the medication use process at which errors occurred: prescribing, documenting, administering, or monitoring. Multiple responses were permitted. Most of the responses were in the "**administration**" phase (56.2%), followed by the "**documentation**" phase (37.4%). We saw only 3.4% of errors reported in the phase of "**prescribing**", and "**monitoring**" accounted for only 3.0% of responses.

Figure 6: Personnel Involved



Nurse Practioner, Physician Assistant and Student had values of <1.0%

H. PERSONNEL INVOLVED

The respondents were asked to identify personnel involved, with multiple responses permitted (Figure 6). "**Licensed practical nurses**" (54.0% of responses) or "**registered nurses**" (29.4% of responses) were involved in most errors. This is to be expected as licensed practical nurses (LPNs) and registered nurses provide most of the direct patient care and delivery of medications at nursing homes, with LPNs doing the bulk of this care. "**Pharmacists**" were involved in 6.9% of errors and "**physicians**" in 4.3% of errors.

I. CONTRIBUTING FACTORS

Nursing homes were asked to provide information identifying all possible factors that contributed to the error, and again multiple responses were allowed (Table 3). Responses under primary contributing factors were: "**frequent distractions"** (40.8%); "**policies and procedures"** (17.3%); and "**workload increase"** (10.2%).

Table 3: Contributing Factors

Contributing Factors	No. of Responses	Percent Responses
Frequent distractions	5,149	40.8%
Policies and procedures	2,185	17.3%
Workload increase	1,287	10.2%
Inadequate information	923	7.3%
Contract staff	904	7.2%
Pharmacy dispensing	776	6.2%
Improper training	583	4.6%
Shift change	372	2.9%
Illegible handwriting	299	2.4%
Emergency situation	79	0.6%
Poor lighting	57	0.5%
TOTAL RESPONSES	**12,614**	**100.0%**

J. MEDICATIONS INVOLVED

Nursing Homes were asked to list the most frequent ten medications that were involved in errors at their site, and the number of error incidents with that medication. If a home observed more than ten errors they were asked to list those medications that were repeatedly involved, or that caused the most serious type of errors. The list was limited to ten per site to reduce the reporting burden for nursing homes, and to limit the medication list. Facilities reported more than 2900 incidents, with about 400 different types of generic medications.

The five most frequently reported medications involved in errors were: lorazepam (Ativan), warfarin sodium (Coumadin), insulin (all types), hydrocodone combinations (Vicodan, Lortab) and furosemide (Lasix) **(**Table 4).

Table 4: Most Frequent Medications

No. INCIDENTS	MEDICATION GENERIC NAME	CLASS OF DRUG	BRAND NAME (S) EXAMPLES
457	LORAZEPAM	BENZODIAZEPINE(TRANQUILIZER), ANTICONVULSANT	ATIVAN
349	WARFARIN SODIUM	ANTI-COAGULANT	COUMADIN
332	INSULIN (ALL TYPES)	ANTI-DIABETIC	HUMULIN, LISPRO,
233	HYDROCODONE COMBINATIONS	NARCOTIC ANALGESIC	VICODAN, NORCO
173	FUROSEMIDE	DIURETICS, LOOP	LASIX
150	FENTANYL PATCH	NARCOTIC ANALGESIC	DURAGESIC
130	ALPRAZOLAM	BENZODIAZEPINE(TRANQUILIZER), ANTICONVULSANT	XANAX
126	OXYCODONE	NARCOTIC ANALGESIC	OXYCONTIN
102	SENNA	LAXATIVES, STIMULANT	
94	CLONAZEPAM	BENZODIAZEPINE(TRANQUILIZER), ANTICONVULSANT	KLONOPIN
86	QUETIAPINE	ANTI-PSYCHOTIC	SEROQUEL
86	ACETAMINOPHEN	ANALGESIC	TYLENOL
80	OLANZAPINE	ANTI-PSYCHOTIC	ZYPREXA
74	DIGOXIN	DIGITALIS PREPARATION	LANOXIN
73	PHENYTOIN	ANTI-CONVULSANT	DILANTIN
69	RISPERIDONE	ANTI-PSYCHOTIC	RISPERDAL
68	MORPHINE	NARCOTIC ANALGESIC	MSIR
65	OXYCODONE AND ACETAMINOPHEN	NARCOTIC ANALGESIC	PERCOCET
64	NITROGLYCERIN PATCH	ANTI-ANGINAL	NITRO-DUR
63	POTASSIUM CHLORIDE	MINERAL SUPPLEMENT	

Table 5: Most Frequent Classes of Medications

No. INCIDENTS	CLASS OF MEDICATIONS
855	NARCOTIC ANALGESIC
747	BENZODIAZEPINE (TRANQUILIZER), ANTICONVULSANT
394	ANTICOAGULANT
364	ANTIDIABETIC (INCLUDING SULFONYLUREA)
329	ANTIBACTERIAL
248	ANTIPSYCHOTIC
224	LAXATIVE (STIMULANT, HYPEROSMOTIC, SOFTENER/LUBRICANT)
199	DIURETICS, LOOP
195	ANTIDEPRESSANT(INCLUDING ANTIOBSESSIONAL, ANTIANXIETY)
159	ANTIANGINAL (INCLUDING CALCIUM CHANNEL BLOCKER)
152	ANALGESIC, ANTI-INFLAMMATORY
138	ANTICONVULSANT (INCLUDING ANTIEPILEPTIC)
127	ANTIHYPERTENSIVE (INCLUDING ACE INHIBITOR AND ANGIOTENSIN II RECEPTOR AGONIST)
127	VITAMIN SUPPLEMENT
114	MINERAL SUPPLEMENT
101	ANTIULCER AGENT(INCLUDING PROTON PUMP INHIBITOR AND HISTAMINE H2 ANTAGONIST)
96	ANTIADRENERGIC, ANTI-ANGINAL, ANTI-ARHYTHMIC, ANTI-HYPERTENSIVE
81	NUTRITIONAL SUPPLEMENT
74	DIGITALIS PREPARATION
73	OSTEOPOROSIS THERAPY

The groups or classes of medications observed the most include: narcotic analgesics, benzodiazepines, anticoagulants, anti-diabetics, anti-bacterials, and anti-psychotics **(**Table 5**)**. We did not collect or have access to comparison data on the frequency of the medications actually provided to nursing home residents during this period.

VI. CONCLUSION AND RECOMMENDATIONS

In the first year of the MEQI, we expected data inconsistencies because of newly developed tools and inconsistencies in initial response patterns as the nursing homes became familiar with the reporting process. However, information from the nine months of data that were collected has already proved fruitful in suggesting useful procedural changes that may enhance the effectiveness of medication delivery to nursing home patients. We expect that the data will improve during the upcoming years as sites become familiar with the process and comfortable sharing their data without fear of punitive action.

The following are some recommendations to facilities, based on the data received during the annual report process:

- ❒ Nursing homes are encouraged to use this report to focus attention within their facility on medication errors and ensure their medication management advisory committee is active.

- ❒ Medication management advisory committees should consider training and providing information to the facility staff members on the definition of a "medication error". It is recommended that all errors be reported and recorded, even if considered insignificant. A non-punitive atmosphere in facilities regarding identifying and reporting medication errors will facilitate more consistent reporting across sites.

- ❒ Medication management advisory committees are advised to focus on: instituting policies and procedures to reduce the number of errors related to frequent distractions; addressing communications and human factors; and putting policies into place that provide checks and balances and ensure that these issues do not lead to medication errors.

- ❒ Medication management advisory committees at sites with a large number of dose omissions need to develop or revise policies and procedures to ensure that all patients get their medications when needed.

- ❒ We recommend that nursing home physicians and pharmacists review all nursing home patients' medications lists to ensure that if patients are on medications, or combinations of medications, listed in the *Beers criteria*[1] that their use is clearly indicated and justified. Beers criteria medications are those included in a consensus panel report identifying medications that are inappropriate or problematic when used in the elderly.

[1] Donna M. Fick; James W. Cooper; William E. Wade; Jennifer L. Waller; J. Ross Maclean; Mark H. Beers. Updating the Beers Criteria for Potentially Inappropriate Medication Use in Older Adults: Results of a US Consensus Panel of Experts *Arch Intern Med*. 2003; 163:2716-2724.

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Nursing Home Medical Error Quality Initiative (MEQI)

January 1, 2004 to September 30, 2004

Medication Error Quality Initiative
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