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QUANTIFICATION AND CHARACTERIZATION OF INPATIENT
PRO RE NATA (PRN) MEDICATION ORDER NONUSE

by
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June 1986

This report submitted in partial fulfillment of the requirements
for the degree of Master of Science in Hospital Pharmacy.

Presented at the 20th Annual ASHP Midyear Clinical Meeting, New
Orleans, LA, 12 December 1985.

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Abstract

Many medications are ordered by physicians to be given on an as needed or Pro Re Nata (PRN) basis. The definition of a PRN order implies that it will be used only when needed. Decentral pharmacists at the University of Wisconsin Hospitals and Clinics (UWHC) observed that inpatients often are ordered PRN medications that are never used. Their observations prompted this study of the nonuse of PRN medication orders at UWHC.

The study objectives were to quantify the nonuse of PRN medication orders at UWHC and to compare PRN order nonuse across several patient and patient stay variables. PRN medication orders for 42 randomly selected patients from each of 21 medical/surgical services (882 patients) were reviewed. PRN medication orders were classified into six therapeutic categories and were tallied as either used or unused. Date of admission PRN orders were tallied separately to determine if the rate of nonuse varied by when the order was written.

A total of 7,735 PRN orders were reviewed; 4,793 (62.0%) were not used. The percent of unused PRN medication orders in therapeutic categories ranged from 85.5 percent for antacids to 55.0 percent for "other" orders. PRN order nonuse rates for patients in different medical/surgical services varied from 50.0 percent for renal transplant patients to 81.0 percent for ophthalmology patients. Higher rates of nonuse occurred for patients with shorter lengths of stay, and orders written on the date of admission had higher rates of nonuse than those written on other days.

INTRODUCTION

In any hospital, a substantial portion of medication orders and doses administered are for medications intended to be given on an "as needed" or Pro Re Nata (PRN) basis. Because PRN medications are given only when needed, some orders may never be used during the patient's stay. Decentral inpatient pharmacists at the University of Wisconsin Hospital and Clinics (UWHC) observed that many PRN medication orders were not used by patients. This observation prompted us to study unused PRN medication orders at UWHC.

Pursuant to a physician's order for a PRN medication, several activities must be performed by pharmacy personnel, regardless of whether a dose is administered to the patient. These activities include: order transcription; transcription verification; order computer entry; and preparation and supply of a dose to the unit. In a given hospital, some activities may be performed by nonpharmacy personnel or may be duplicated by pharmacy and nonpharmacy personnel, depending on the medication distribution system. When the order is discontinued by the physician or the patient is discharged, a similar reverse process occurs. PRN medication orders that are written and processed, but never used by the patient, create work for pharmacy personnel (and others) but the patient receives no benefit, resulting in unproductive and unnecessary work.

Several authors have investigated PRN medication order utilization in institutional settings. Utilization rates for PRN medication orders in skilled nursing and long-term care facilities ranging from 40 to 60 percent have been reported.¹⁻⁶ These studies in nursing homes considered all PRN medication orders. Studies conducted in hospitals focusing only on PRN hypnotic orders have shown utilization rates between 60 and 90 percent.⁷⁻⁹ The

previous authors have reported their findings as utilization rates; however, this study will focus on the complement of utilization, nonuse of PRN medication orders.

Our goal was to better understand the incidence of unused PRN orders and the factors associated with nonuse. The specific study objectives were to:

- 1) Quantify the incidence of unused PRN medication orders at UWHC.
- 2) Compare PRN order nonuse across patient and patient stay variables, including: patient age and sex; length of stay; medical/surgical services; DRG major diagnostic categories; therapeutic category of the medication; and when during the patient stay the order was written.

METHODS

This study was conducted at the University of Wisconsin Hospital and Clinics (UWHC). The inpatient facility at UWHC is a 550-bed tertiary care referral center which serves as the primary teaching hospital for the Schools of Medicine, Nursing, and Pharmacy at the University of Wisconsin. Retrospective chart reviews were conducted for 882 patients. Forty-two patients were randomly selected from each of 21 medical/surgical services at UWHC. To limit potential seasonal variations in PRN order writing or use, seven patients were selected for study from each of the last six calendar months of 1984. All medical/surgical services at the University of Wisconsin Hospital were represented in the study except those with an annual census less than 250 patients. A list of included and excluded services, with total admissions for FY 1984-85, is shown in Appendix 1.

A PRN medication was defined as a medication intended to be administered to a patient on an "as needed" basis rather than on a regular or scheduled

basis. Each PRN medication order was classified into a therapeutic category, determined by the intended beneficial effect to the patient. For example, diazepam ordered "as needed for sleep," was classified as a hypnotic, whereas when ordered "as needed for nausea" was classified as an antiemetic. A complete list of therapeutic category definitions is shown in Appendix 2.

Demographic and PRN medication utilization data were collected for each patient. The patient's name, medical record number, age, sex, service, length of stay, DRG code, and date of admission were recorded on data collection forms. A copy of the data collection form is shown in Appendix 3. Information regarding the use of PRN medication orders was obtained from the final pharmacy computer generated report of medication orders and doses administered. This report is filed with the permanent medical record upon patient discharge from the hospital. Internal audits at UWHC comparing medication administration records and computer printouts have shown the information on the report to be 98% accurate. Orders for PRN medications were easily identified because the text of PRN orders contain the term "PRN" as well as directions and a brief explanation of the intended effect of the medication.

Data collection was aided by a trained data collector and periodic validity checks of the information collected were performed. Orders written on the date of admission were tallied separately from those written on subsequent days. A PRN medication order was considered used if the computer report showed that one or more doses were administered to the patient pursuant to that order at any time during the hospital stay. This appeared on the computer printout as one or more doses recorded in the "doses" column. Conversely, unused orders showed zero doses administered on the report.

All PRN medication orders were tallied except those listed on the

computer printout as being "multidose" or "self-administered" PRN orders. Multidose items were large supplies of medications such as bottles of antacids and bulk creams from which doses are taken as needed. Self-administered medications were those for which dosing is done by the patient. These categories were excluded because the medication administration record and computer printout often do not accurately indicate actual doses administered.

Aggregate percentages of unused orders were calculated by summing the number of unused PRN orders for all patients and dividing by the total number of PRN orders written. Percents of unused orders were compared across each of the five patient variables (sex, medical/surgical service, DRG-major diagnostic category, age, and length of stay) and whether the order was written on the date of admission or on a subsequent day in the patient's stay. Within each comparison, PRN orders were grouped according to therapeutic category.

RESULTS/DISCUSSION

Sample Representativeness

Table 1 shows the patient demographics for the study sample and all patients admitted to UWHC during FY 1984-85. The sample was representative of all patients with the exception of age and number of PRN orders per stay. The overall average age of study patients was 4.6 years older than for all patients (42.8 versus 47.4 years). This age difference might be attributed to the sampling technique. Each medical/surgical service had an equal number of patients selected for the study, whereas the total number of patients admitted annually to each service varied considerably (see Appendix 1). Although pediatric patients comprise 18 percent of all admissions to UWHC, the study sample had less than 5 percent pediatric patients. Therefore, pediatric patients

were underrepresented in the sample causing a higher average age of study patients. The mean number of PRN orders was slightly lower for study patients (8.8 versus 9.2) likely because some PRN orders (i.e., multidose, self-administered) were excluded from the study.

Unused PRN Orders-All Patients

A total of 7,735 PRN medication orders were reviewed, of which 4,793 (62.0 percent) were unused. Table 2 summarizes, for all study patients, the number of orders, orders per patient, and the percent unused orders classified by therapeutic category.

The percent of unused orders in therapeutic categories ranged from 55.0 percent for "others" to 85.5 percent for antacids. The majority of PRN orders in all therapeutic categories were not used. Antacids were the least prescribed PRN medication but had the highest rate of nonuse. Analgesics had the highest prescribing rate; 53.7 percent of all PRN orders studied were written for analgesics.

Orders in the "other" therapeutic category consisted primarily of sliding scale potassium supplementation, sliding scale insulin orders and miscellaneous orders such as those for extrapyramidal reactions. Nonuse of "other" PRN orders was the lowest, possibly because no routinely ordered medications fit in this category. Routine orders may be written in anticipation of a more general contingency of need. But, the need for medications in the "other" category actually may arise prior to the written order, or orders may be written prior to a need that is anticipated because of a specific patient condition. This would result in a lower nonuse rate for PRN orders in the "other" therapeutic category.

Male Versus Female Patients

Differences in the rates of nonuse of PRN medication orders between male and female patients are presented in Table 3. In Table 3 and subsequent tables, nonuse rates along with the number of orders per patient and the number of patients with an order are presented. This gives a more complete picture of PRN order nonuse, showing not only the rate of nonuse, but the intensity of PRN order writing and use.

Male patients had higher rates of unused orders overall and in every therapeutic category except "others." A closer look at the data revealed that the average number of used PRN medication orders was almost identical for male and female patients (3.36 versus 3.41). However, male patients averaged more unused PRN orders than female patients (5.76 versus 5.06). The difference in rates of PRN order use resulted not because female patients more often used medications ordered on a PRN basis, but because PRN medications are ordered slightly more often for male patients. We have not postulated a reason for this observation.

Admit Date Versus Not Admit Date Orders

Rates of nonuse for PRN orders written on the date of admission versus those written on subsequent dates in the patient's stay are shown in Table 4. In every therapeutic category, the rate of unused orders was higher for those orders written on the date of admission. Of particular note was that 92.7 percent of antacid orders written on the date of admission were not used.

Overall, 33 percent of all PRN medication orders were written on the date of admission. However for PRN orders in the "other" therapeutic category,

fewer than 16 percent of the orders were written on the date of admission. Also, the percent nonuse of "other non-admission orders" was lowest. This supports the notion that date of admission orders are more often "routine" orders, written in anticipation of general future need, whereas non-admission orders reflect a more specific anticipated need.

The majority of PRN analgesic orders are written after the date of admission. This likely reflects the large number of orders written for post-operative pain, which usually are written on the second or third day in the hospital stay. Orders written on the date of admission have higher rates of nonuse; however, the magnitude of prescribing is not as great. Because analgesics show the greatest magnitude of PRN prescribing, they would serve as a good starting point to decrease the number of unused orders, especially for those written on the date of admission.

Medical/Surgical Service

The percent of unused PRN orders for each medical/surgical service, crosstabulated by therapeutic category is presented in Table 5. There was considerable variability in the nonuse rates, prescribing rate, and number of patients with an order. Cardiovascular surgery had, by far, the highest laxative prescribing rate (3.1 orders per patient) compared to the next highest, psychiatry (1.3 orders per patient). Renal transplant had the highest analgesic prescribing rate (10.4 orders per patient), and psychiatry had the lowest (1.2 orders per patient).

The percent unused of all PRN orders for medical/surgical services ranged from a low of 50 percent for renal transplant patients to a high of 81 percent for ophthalmology patients. The average number of PRN orders written during a

patient stay ranged from 20.8 orders for cardiovascular surgery patients to 3.9 orders for pediatric patients.

An observation was made during data collection that those services with preprinted physician's orders had higher rates of nonuse. For example, the ophthalmology service uses preprinted physician's orders and had more than 80 percent of all PRN orders unused. One possible explanation of this observation is that preprinted orders may encourage liberal writing of PRN orders to satisfy any patient contingency without critically evaluating specific anticipated patient needs.

Some service/therapeutic category combinations showed a very high rate of nonuse. For example, although almost every cardiovascular surgery patient was ordered a laxative for PRN use, 89 percent of those orders went unused. Also, although 41 of 42 ophthalmology patients had a PRN analgesic order, 81 percent of those orders were unused. Service/therapeutic category combinations with exceptionally high rates of nonuse of PRN orders, and large numbers of patients with an order, might be target areas for examining PRN medication nonuse more closely.

DRG-Major Diagnostic Category

All patients at UWHC are assigned a Diagnosis Related Group (DRG) code by the medical records department. The 468 codes in the DRG classification scheme are divided into 23 Major Diagnostic Categories (MDCs). The 882 study patients were categorized into 21 of the 23 possible MDCs and the number of patients in each MDC varied between 125 in circulatory disorders and 4 in substance abuse. Nine of the MDCs encompassed over 70 percent of the study patients (618 of 882). The results from MDCs with more than 40 study patients

are presented in Table 6.

The MDC data somewhat parallel the medical/surgical service data. The MDC with the highest percent of unused orders was eye disorders (80 percent), and the MDC with the lowest percent unused was kidney disorders (52 percent). As with the services, the DRG MDCs showed a wide range of percent unused orders in all therapeutic categories. Overall, however, the MDC ranges for the average number of PRN orders were not as wide as for those in medical/surgical services. This may be because pediatric patients are included in each of MDCs as opposed to being grouped into only one service and pediatric patients tended to have fewer PRN medications prescribed for them. A patient's assigned DRG MDC may be a good predictor of PRN order nonuse but perhaps not as useful as the medical/surgical service. The MDC that a patient is assigned to is not likely to be known by those caring for the patient, whereas the patient's service is generally well known.

Length of Stay

The rate of unused PRN medication orders for patients with varying lengths of stay was studied by creating four categories of length of stay: 1) one or two days, 2) three to five days, 3) six to ten days, and 4) more than ten days. A summary of the percent of unused PRN orders for patients with varying lengths of stay and in different therapeutic categories is shown in Table 7.

The percent of unused PRN orders per patient decreased as the length of stay increased in all therapeutic categories. This might be expected, because as the length of stay increases, the chance of a patient requiring and using a PRN medication would increase.

Of particular note is the high percent of unused orders for patients with lengths of stay of one to two days. Patients with lengths of stay of one or two days accounted for more than 25 percent of the admissions to UWHC during FY 1984-85 and as inpatient lengths of stay decrease further, as is the national and local trend, the percentage of patients in the 1- to 2-day stay category likely will increase.

Length of stay may be a good indicator of PRN medication order nonuse. If a system were developed to prospectively determine the length of stay, it might serve as a good prediction system for PRN order nonuse. The length of stay data also suggest that a potentially effective strategy to decrease the number of unused orders might be to limit PRN order writing on the date of admission and delay prescribing PRN medications until need for the medication can be anticipated better.

Age

To compare patients in different age groups, the study patients were divided into five age categories. The percents of unused PRN orders for patients in different age categories, crosstabulated by therapeutic category are presented in Table 8.

In review of the data, there do not appear to be trends in PRN medication order nonuse as age increases or decreases. The overall rate of nonuse varied by only 6 percentage points between all age categories. However, the youngest and oldest age categories generally had the highest rates of nonuse.

Study Limitations

This study identified only the incidence of unused PRN medication orders across several variables. The motives of PRN order writing and use were not

addressed, nor were other factors of PRN medication use and administration investigated, such as nurse and patient attitudes. Identification of these "whys" is fundamental to maximizing the efficiency of PRN medication distribution systems.

A procedural limitation of the study resulted from the sampling technique which was designed to include the same number of study patients (42) into each of the medical/surgical services. Since the actual distribution of patients in each service varied between 2397 (pediatrics) and 25 (critical care) patients in FY 1984-85, the proportion of study patients in each service did not mimic all hospital patients.

Also, because of the descriptive nature of the study, analyses were kept simple. All percentages reported were calculated independent of other variables, neglecting potential confounding effects of the variables.

Future Research

This study has identified the percent of unused PRN medication orders in one institution. Additional research will need to be conducted to clarify the issue. A complete cost analysis of unused PRN medication orders should be conducted, considering pharmacy- and nonpharmacy-related costs. This study showed that PRN orders written on the date of admission are less likely to be used, but the time frame of order writing and use was not completely examined. Relationships between PRN (and other) medication use at home and inpatient PRN order use should be investigated. If relationships exist, admission medication histories could become valuable in helping predict PRN order use among hospitalized patients. Finally, the effects of strategies to decrease the proportion of unused PRN orders should be documented.

CONCLUSIONS

The overall rate of unused PRN medication orders studied at UWHC was seemingly high when compared to previously reported rates for nursing homes. However, there are no clear standards with which to judge this result. An acceptable level of nonuse for PRN medications orders has not been determined previously. Sedative/hypnotics had a nonuse rate of 61.9 percent which is higher than that previously reported for other hospitals.⁷⁻⁹ However, the study design and population selection of this study differed compared to the prior studied.

Variability occurred in the percent of unused orders, number of PRN orders per patient and the number of patients with a PRN order. The data suggest that efforts to further examine PRN order nonuse should be focused on orders written on the date of admission, those written for patients with short (or anticipated short) lengths of stay, and those written for patients admitted to certain medical/surgical services (i.e., ophthalmology). PRN order nonuse may vary from hospital to hospital; however, it is likely that a cursory examination of PRN medication cassettes in a given hospital can sensitize the pharmacy manager to where problems might be.

Two approaches can be postulated to attempt to decrease the number of unused PRN medications. The processing of PRN orders can be delayed until the patient demonstrates need. This would ensure that only a minimal amount of work would be performed for those orders that would never be used. However, this approach has the potential to delay dose administration to the patient due to processing time. Some therapeutic categories of PRN medications may not create a patient discomfort or alter therapeutic efficacy if a dose was

not available within an hour. However, for other items a delay could cause a patient to have increased anxiety or to lose sleep. These factors must be considered when evaluating the PRN medication nonuse data.

The second possible approach to decreasing the number of unused PRN orders is education of physicians, pharmacists, and other health care professionals about unused PRN orders and their costs and benefits. Before this may be accomplished, more must be known about the true costs and benefits of PRN orders, including effects on physicians, nurses, and patients.

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Table 1: Comparison of Study Patients to All Patients Admitted During FY 1984-85

	<u>Study Patients</u>	<u>All Patients FY 1984-85</u>
Percent Male	53.5%	52.3%
Percent Female	46.5%	47.7%
Length of Stay	8.3 days	8.4 days
Age	47.4 years	42.8 years
Average PRN Orders/Stay	8.8 orders	9.2 orders
Number of Patients	882	16,039

Table 2: Unused PRN Orders for All Patients

<u>Therapeutic Category</u>	<u>Total PRN Orders</u>	Percent ^a <u>Unused</u>	Average ^b <u>Orders/Patients</u>
Analgesics	4151	59.8%	4.7
Sedative/Hypnotics	1258	61.9%	1.4
Other	1060	55.0%	1.2
Laxatives	687	79.2%	0.8
Antiemetics	372	72.9%	0.4
<u>Antacids</u>	<u>207</u>	<u>85.5%</u>	<u>0.2</u>
Overall Total	7735	62.0%	8.8

^aNumber of unused PRN orders divided by total PRN orders

^bThe average orders/patient were calculated by dividing total PRN orders by the number of study patients (882)

Table 3: Nonuse of PRN Orders for Male and Female Patients

<u>Therapeutic Category</u>	Female Patients (N=410)			Male Patients (N=472)		
	<u>%^a</u>	<u>N^b</u>	<u>p^c</u>	<u>%^a</u>	<u>N^b</u>	<u>p^c</u>
Analgesics	56.9%	4.3	374	59.5%	5.1	419
Sedative/Hypnotics	59.5%	1.5	324	64.2%	1.4	345
Other	60.0%	1.1	114	51.4%	1.3	141
Laxatives	76.4%	0.7	222	81.3%	0.8	265
Antiemetics	65.8%	0.5	121	81.2%	0.4	103
Antacids	80.4%	0.2	78	89.6%	0.2	88
Total	60.5%	8.5	396	63.1%	9.1	450

^aPercent unused PRN orders

^bAverage number of orders per patient (e.g., total number of analgesic PRN orders for female patients divided by 410, etc.)

^cNumber of patients with PRN order

Table 4: Nonuse of PRN Orders Written on the Date of Admission and Subsequent Dates

<u>Therapeutic Category</u>	<u>Date of Admission</u>			<u>Not Date of Admission</u>		
	<u>%^a</u>	<u>N^b</u>	<u>p^c</u>	<u>%^a</u>	<u>N^b</u>	<u>p^c</u>
Analgesics	65.0%	1.3	588	56.5%	3.5	516
Sedative/Hypnotics	66.9%	0.8	521	55.8%	0.6	299
Other	60.5%	0.2	352	54.0%	1.0	206
Laxatives	80.9%	0.4	84	77.2%	0.3	189
Antiemetics	78.2%	0.1	110	70.2%	0.3	150
Antacids	92.7%	0.1	83	74.7%	0.1	64
All orders	69.5%	2.9	691	58.2%	5.9	593

^aPercent unused PRN

^bAverage number of orders per patient (e.g., total number of analgesic orders on admission day divided by 882 patients, etc.)

^cNumber of patients with an order

Table 5: Nonuse of PRN Orders Medical/Surgical Services

	Analgesics			Laxatives			Sed/Hypn			Antiemetics			Antacids			Others			All Orders			
	%	N ^b	P ^c	%	N ^b	P ^c	%	N ^b	P ^c	%	N ^b	P ^c	%	N ^b	P ^c	%	N ^b	P ^c	%	N ^b	P ^c	
Medical/Surgical Service																						
Cardiovascular Surgery	65%	9.1	42	89%	3.1	41	59%	2.5	40	57%	0.2	3	94%	0.9	25	67%	5.1	37	69%	20.8	42	
Cardiovascular Medicine	50%	2.1	37	92%	0.9	33	55%	1.5	36	80%	0.1	3	77%	0.3	11	66%	0.9	9	66%	5.6	41	
Gastroenterology	54%	2.9	35	88%	0.8	21	67%	1.2	34	80%	0.2	6	86%	0.2	6	73%	0.5	8	65%	5.8	39	
General Medicine	48%	1.5	25	79%	0.6	18	43%	1.0	25	63%	0.4	8	82%	0.3	9	53%	0.4	8	55%	4.2	32	
General Surgery	52%	7.3	39	80%	0.4	18	61%	1.3	35	86%	0.3	12	77%	0.3	8	51%	0.8	24	56%	10.5	42	
Gynecology	51%	5.7	36	47%	0.4	11	49%	1.7	39	67%	1.1	35	100%	0.2	7	76%	0.7	13	55%	9.8	41	
Hematology	58%	3.0	39	89%	0.7	23	58%	1.4	31	93%	0.7	18	50%	0.1	4	49%	1.4	15	63%	7.2	41	
Neurology	58%	2.0	39	77%	0.7	28	65%	0.8	25	20%	0.2	5	80%	0.1	4	57%	0.7	5	61%	4.6	42	
Neurosurgery	41%	3.8	39	74%	0.8	23	63%	0.7	20	50%	0.1	6	67%	0.1	2	89%	0.2	6	51%	5.8	39	
Oncology	51%	3.1	32	88%	0.4	14	65%	1.1	33	60%	.1	24	90%	0.2	8	29%	0.3	10	58%	6.4	39	
Ophthalmology	81%	4.3	41	86%	0.8	34	73%	0.9	35	95%	0.9	17	94%	0.4	16	64%	0.7	5	81%	7.9	42	
Orthopedic Surgery	67%	8.4	42	86%	0.3	12	71%	1.8	40	100%	0.1	2	100%	0.2	6	67%	0.2	4	69%	11.1	42	
Otolaryngology	69%	6.1	42	82%	0.6	24	65%	-1.0	36	87%	0.4	14	89%	0.4	18	73%	0.4	11	71%	8.9	42	
Pediatrics	63%	2.9	32	86%	0.2	3	100%	0.1	3	60%	0.2	7	0%	0.1	1	51%	0.4	9	63%	3.9	36	
Peripheral Vasc. Surgery	64%	8.9	41	73%	1.0	29	65%	2.4	39	50%	0.2	7	75%	0.2	8	60%	1.8	16	64%	14.5	42	
Plastic Surgery	59%	6.2	42	74%	0.6	24	71%	1.2	33	85%	0.9	22	75%	0.2	6	50%	0.5	9	64%	9.7	42	
Psychiatry	45%	1.2	39	61%	1.3	39	62%	4.0	38	---	0	0	33%	0.1	2	56%	0.8	16	60%	7.1	40	
Pulmonary Medicine	57%	1.8	36	67%	0.9	27	60%	1.1	27	67%	0.3	7	85%	0.3	11	37%	0.6	6	59%	5.1	38	
Renal Medicine	48%	2.9	35	63%	0.8	26	56%	1.0	26	76%	0.4	9	75%	0.1	4	62%	1.5	17	56%	5.7	41	
Renal Transplant	51%	10.4	41	97%	0.7	14	51%	1.7	36	57%	0.5	11	100%	0.4	10	41%	6.9	13	50%	20.7	41	
Urology	60%	5.1	40	64%	0.7	25	77%	1.4	38	89%	0.2	7	---	0	0	45%	0.4	14	63%	7.8	42	

^aPercent unused PRN orders

^bAverage number of PRN orders per patient

^cNumber of patients with an order

Table 6: Nonuse of PRN Orders for Across DRG Major Diagnostic Categories

Major Diagnostic Category	Analgesics			Laxatives			Sed/Hypn			Antiemetics			Antacids			Others			All Orders		
	% ^a	N ^b	PC	% ^a	N ^b	PC	% ^a	N ^b	PC	% ^a	N ^b	PC	% ^a	N ^b	PC	% ^a	N ^b	PC	% ^a	N ^b	PC
01-Nervous Disorders (74)	54%	3.2	69	82%	0.6	34	59%	0.9	40	54%	0.3	12	50%	0.1	6	52%	0.9	18	57%	6.1	72
02-Eye Disorders (43)	79%	4.2	42	86%	0.8	34	73%	0.9	35	95%	0.9	18	94%	0.4	16	64%	0.7	5	80%	7.8	43
03-Ear, Nose, Throat (45)	63%	5.4	44	85%	0.8	24	71%	1.1	32	71%	0.5	18	90%	0.3	13	67%	0.3	11	67%	8.3	45
04-Respiratory (58)	57%	1.7	45	71%	0.8	31	62%	1.1	38	73%	0.2	13	86%	0.4	17	46%	0.4	9	63%	4.9	52
05-Circulatory (125)	63%	5.9	113	85%	1.6	100	58%	2.0	109	62%	0.2	14	85%	0.5	42	67%	2.5	61	67%	12.7	121
06-Digestive Disorders (71)	58%	4.3	63	84%	0.5	24	61%	1.0	50	80%	0.4	14	80%	0.2	14	52%	0.6	17	62%	6.9	66
08-Musculoskeletal (84)	62%	6.4	82	74%	0.5	34	66%	1.3	66	57%	0.3	12	87%	0.2	14	67%	0.3	14	64%	9.0	83
11-Kidney Disorders (74)	48%	6.0	68	74%	0.8	43	60%	1.5	61	63%	0.4	15	91%	0.1	10	43%	2.5	29	52%	11.3	72
19-Mental Disorders (44)	54%	1.3	39	63%	1.0	38	66%	3.3	38	---	0	0	50%	0.1	2	63%	0.7	14	62%	6.3	41

(Number of Study Patients per MDC)

^aPercent unused PRN orders

^bAverage number of PRN orders per patient

^cNumber of patients with an order

Table 7: Nonuse of PRN Medication
Orders by Length of Stay

Therapeutic Category	Length of Stay Category											
	1-2 days (N=254 ^a)			3-5 days (N=230 ^b)			6-10 days (N=211 ^b)			10 days (N=187 ^a)		
	\bar{x}^b	N ^c	p ^d	\bar{x}^b	N ^c	p ^d	\bar{x}^b	N ^c	p ^d	\bar{x}^b	N ^c	p ^d
Analgesics	76%	2.7	215	67%	3.8	206	55%	5.1	193	49%	8.2	179
Sedative/Hypnotics	77%	0.8	158	70%	1.2	182	61%	1.6	174	50%	2.3	155
Other PRN Orders	89%	0.2	29	65%	0.3	34	63%	1.2	80	49%	3.7	112
Laxatives	98%	0.4	93	84%	0.6	127	77%	1.0	136	70%	1.3	131
Antiemetics	86%	0.3	56	81%	0.4	62	71%	0.4	47	57%	0.6	59
Antacids	100%	0.1	24	90%	0.3	52	85%	0.3	45	76%	0.3	45
All Orders	80%	4.6	234	71%	6.5	221	61%	9.6	206	52%	16.5	185

^aNumber of patients categorized in that length of stay group
^bPercent unused PRN orders
^cAverage number of PRN orders per patient
^dNumber of patients with a PRN order

Table 8: Nonuse of PRN Medication Among Patients Grouped by Age

Therapeutic Category	0-17 years (N=66 ^a)			18-35 years (N=218 ^a)			36-50 years (N=171 ^a)			51-64 years (N=204 ^a)			65 and over (N=223 ^a)		
	\bar{x}^b	N^c	p^d	\bar{x}^b	N^c	p^d	\bar{x}^b	N^c	p^d	\bar{x}^b	N^c	p^d	\bar{x}^b	N^c	p^c
All PRN Orders	66%	6.0	60	60%	8.7	208	60%	10.0	167	61%	9.3	198	66%	8.1	213
Analgesics	66%	4.3	57	56%	4.8	200	54%	5.5	157	58%	5.0	187	67%	3.8	192
Sedative/Hypnotics	67%	0.8	24	66%	1.5	173	67%	1.5	140	57%	1.4	162	58%	1.5	170
Other PRN Orders	46%	0.4	10	46%	1.1	53	54%	1.5	58	59%	1.3	66	61%	1.2	68
Laxatives	88%	0.3	11	77%	0.6	117	85%	0.8	100	81%	0.9	112	75%	1.0	157
Antiemetics	75%	0.2	9	76%	0.5	69	66%	0.5	49	74%	0.4	44	74%	0.4	49
Antacids	60%	0.1	3	90%	0.2	32	93%	0.3	31	78%	0.3	49	87%	0.2	51

^aNumber of study patients in that age category

^bPercent unused PRN orders

^cAverage number of PRN orders per patient

^dNumber of patients with an order

Appendix 1: Number of Admissions During FY 1984-85
 In the Medical/Surgical Services Included and Excluded in the Study

<u>Included Services</u>	FY 1984-85 <u>Admissions</u>	<u>Excluded Services</u>	FY 1984-85 <u>Admissions</u>
Cardiovascular Medicine	785	Affective Disorders	48
Cardiovascular Surgery	406	Allergy/Immunology/ Rheumatology & Endocrine	230
Family Practice/ General Medicine	518	Burn	78
Gastroenterology	292	Critical Care	25
General Surgery	990	Dermatology	67
Gynecology	842	Eating Disorders	109
Hematology	518		
Neurology	523		
Neurosurgery	525		
Oncology	1482		
Ophthalmology	854		
Orthopedics	1304		
Otolaryngology	472		
Pediatrics	2895		
Peripheral Vascular Surgery	341		
Plastic Surgery	411		
Psychiatry	377		
Pulmonary Medicine	288		
Renal Medicine	349		
Renal Transplant	511		
Urology	805		

Appendix 2: Treatment Category Descriptions

- ANALGESIC^a** - Any medication prescribed for the relief of pain (specific or generalized), aches, irritability or similar symptoms.
- ANTIPYRETIC^a** - Any medication prescribed for the relief of fever, temperature (specific or generalized) or similar symptoms.
- ANTIINFLAMMATORY^a** - Any medication prescribed for the relief of inflammation, swelling or similar symptoms.
- ANTACID** - Any medication prescribed for the relief of gastrointestinal upset, stomach upset, gastrointestinal distress, heartburn, dyspepsia or similar symptoms.
- ANTIEMETIC** - Any medication prescribed for the relief of nausea, vomiting or similar symptoms.
- LAXATIVE/STOOL SOFTNER** - Any medication prescribed for the relief of constipation, hard stools or similar symptoms.
- SEDATIVE^b** - Any medication prescribed for the relief of anxiety, nervousness or similar symptoms or prescribed for sedation.
- HYPNOPTIC^b** - Any medication prescribed for the relief of sleeplessness, tiredness, restlessness or for similar symptoms or prescribed for sleep.
- OTHER THERAPEUTIC CATEGORY** - Any medication prescribed for the relief of symptoms not specifically mentioned or implied above.

^aAnalgesic, antipyretic, and antiinflammatory agents were combined into one group because some products overlap into more than one category

^bSedative and hypnotic agents were combined into one group because some products overlap into both categories

APPENDIX 3 DATA COLLECTION FORM
PRN UTILIZATION STUDY

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COLLECTOR _____ DATE/TIME OF COLLECTION _____

PT'S NAME(LAST NAME FIRST) _____ MR# _____

AGE _____ SEX _____ CODE _____ SERVICE _____ SERVICE CODE _____

LENGTH OF STAY(DAYS) _____ PT CODE NUMBER _____ DRG CODE _____

ANALGESICS/ANTIPYRETICS/ANTIINFLAMATORYS: DATE OF ADMISSION _____

D/A Other

D/A Other

USED _____ ORAL ANALGESICS-SCHEDULED SUBSTANCES # NOT USED _____

USED _____ ORAL ANALGESICS-NON-SCHEDULED # NOT USED _____

USED _____ PAREN ANALGESICS-SCHEDULED SUBSTANCES # NOT USED _____

USED _____ PAREN ANALGESICS-NON-SCHEDULED # NOT USED _____

USED _____ OTHER ROUTE ANALGESICS-SCHEDULED # NOT USED _____

USED _____ OTHER ROUTE ANALGESICS-NON-SCHEDULED # NOT USED _____

LAXATIVES/STOOL SOFTNERS:

USED _____ MILK OF MAGNESIA ORDERS # NOT USED _____

USED _____ BISACODYL ORDERS # NOT USED _____

USED _____ OTHER LAXATIVES/STOOL SOFTNERS # NOT USED _____

SEDATIVE/HYPNOTICS:

USED _____ BENZODIAZEPINE SED/HYP ORDERS # NOT USED _____

USED _____ OTHER SED/HYP ORDERS # NOT USED _____

ANTINAUSEANTS:

USED _____ ORAL ANTINAUSEANT ORDERS # NOT USED _____

USED _____ PARENTERAL ANTINAUSEANT ORDERS # NOT USED _____

USED _____ OTHER ANTINAUSEANT ORDERS # NOT USED _____

ANTACIDS:

USED _____ MAG AND ALUM +/- SIMETHICONE ORDERS # NOT USED _____

USED _____ ALUM HYDROX ORDERS # NOT USED _____

USED _____ MAGALDRATE ORDERS # NOT USED _____

OTHERS:

USED _____ # NOT USED _____