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Real Association of Factors with Inappropriate Hospital Days

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Abstract

Several studies of inappropriate (in the sense of the AEP) hospital days highlighted associations between two factors (rate of inappropriateness and reasons for inappropriateness, rate of inappropriateness and appropriate setting of care,…). The aim of this communication is to present a study on real associations, at constant factor, between five factors associated with hospital inappropriate days: medical management process, reason for inappropriateness, scheduled admission, rate of inappropriateness, length of stay. We used the European version of Appropriateness Evaluation Protocol for evaluation of inappropriate days and the French protocol ;for analysis of inappropriate days. The study set in three Parisian hospitals, four clinical departments, three specialities. 523 patients were included in the study, 5663 days were evaluated on a wide variety of pathologies: 27 Medical Management Processes. Results show that there are real associations (elimination of transitive associations) between five factors : medical management process and discharge processes, reason for inappropriateness, scheduled admission, rate of inappropriate days, length of stay. Multiple Correspondence Analysis on all "groups of contiguous days related with the same reason for inappropriateness" shows five profiles of queues integrating various medical management processes.

Keywords:
Hospital; Iinappropriateness; Factors

1. Introduction

Reduction in hospital inappropriateness in the sense of the Appropriateness Evaluation Protocol (EU-AEP) [1] is a general objective for health care managers [2] as well as quality experts because this inappropriateness has heavy consequences: lower quality of care, lower quality of life for patients, lower performances,… Understanding the basic mechanism of the elaboration process of hospital inappropriateness is crucial for reduction of inappropriateness.

In this sense, our research differ from other studies which have looked for associations between two variables: rate of inappropriateness and reasons for inappropriateness [3] rate of inappropriateness and appropriate setting of care [4], rate of inappropriateness and position of inappropriate days in the stay [5], importance of admission and discharge processes [6] , importance of patient's age, availability of home care, medical speciality [7] . All these studies give associations without eliminating transitivity between factors.

The aim of this communication is to present a study on real associations, *at constant factor*, between five factors associated with hospital inappropriate days (medical management process, reason for inappropriateness, scheduled admission, rate of inappropriateness, length of stay).

We proceed as follows. In the next section we present tools used for evaluation and analysis, the setting of data collection, data analysis strategy (targeted on queue analysis & medical-management-process analysis. In the third section we present results with statistical tests and multivariate analysis. In the fourth section we discuss two supplementary computed variables for aid to decision and quality improvement projects.

2. Materials and Methods

Tools

Two tools were used for evaluation and analysis: first, EU-AEP [8] (24 clinical criteria) (for the purpose of the study, the EU-AEP was validated [9] for acute geriatrics), second, French Inappropriateness Analysis Protocol [10] (two parts: part one relates to reasons for inappropriateness (13 criteria in four subsets), part two relates to appropriate setting of care (8 criteria in two subsets).

Data Collection

All patients aged 18 or older and not under the care of a psychiatrist. were eligible for inclusion in the study provided they were admitted to gastro-enterology or to orthopaedic surgery (hôpital Avicenne), between may 11th 2000 and July 14th 2000 (and between September 4th and October 12th 2000 for orthopaedic surgery only), to acute geriatrics between November 21st 2001 and January 30th 2002 ("Hôpital Européen Georges Pompidou" and "Hôpital ND Bon Secours"). A trained physician (not part of the medical team) collected high quality and exhaustive data (1 per thousand missing data). Daily evaluation of appropriateness and analysis of inappropriateness was executed from to for each patient.

For each included patient, each day (from admission to discharge, except admission day - not evaluated, because criteria are different - and discharge day - not evaluated because it is not a full day-) appropriateness was evaluated from EU-AEP[8,] with no use of the override option; if inappropriate then analysis of inappropriateness was evaluated from the French Inappropriateness Analysis Protocol[10].

Demographic data were extracted from the hospital's computerized data: name, surname, sex, age, zip code, date of admission, date of discharge, mode of admission, mode of discharge. Clinician's discharge summary gave Medical Management Process and its associated discharge process. Social data (household status), administrative data (scheduled / not scheduled admission), medical data (reason for admission) were measured. Some variables by Medical Management Process were computed: total inappropriate days by reason for inappropriateness, total inappropriate days, total number of queues (with mean delay and sd), rate of inappropriateness (total inappropriate days / total evaluated days), length of stay, rate of scheduled admissions, distribution of appropriate settings of care.

Data analysis strategy

523 patients were included in the study, 5663 days were evaluated on a wide variety of pathologies: 27 Medical Management Processes (MMPs) in orthopaedic surgery, 14 MMPs in gastro-enterology, 12 MMPs in acute geriatrics. Grouping MMPs led to 4 MMPs in orthopaedic surgery, 3 MMPs in gastro-enterology, 3 MMPs in geriatrics. 46 patients were

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excluded for grouping and for statistical tests (too small size groups). 477 patients were processed.

Data analysis aimed at two targets: queue analysis & medical management process analysis. For each target we developed a two-step analysis. First, a global analysis to highlight groups of queues and groups of Medical Management Processes (MMPs) that totalize big amounts of inappropriate days. Second, a detailed analysis to identify and to characterize precise queues and precise characteristics of inappropriateness by MMP.

The data were analysed using SAS (V8.2 / PC), 5% level of significance for statistical tests. Moreover, multiple correspondence analysis (MCA) was applied (SAS V8.2 / PC) to identify associations among sets of categorical variables for queues and for medical management processes; MCA was chosen for several reasons: our goal was an exploratory approach; no underlying distribution has to be assumed, no model has to be hypothesized. MCA analysis highlighted a compound variable of inappropriateness by queue and a compound weight of inappropriateness by medical management process.

3. Results

Global analysis

477 patients were analysed (114 in gastro-enterology, 174 in orthopaedic surgery, 189 in geriatrics) : 235 (49%) male, 242 (51%) female, 200 (42%) living alone, 277 (58%) not living alone, mean age 64.2 (SD 23.7). 218 patients (46%) had a fully appropriate stay while 259 (54%) were included in one (at least) queue, 153 (32%) had a scheduled admission, 172 (36%) were admitted in emergency.

Detailed analysis

In table 1, it is presented some details about the main reasons for inappropriate days.

Table 1 – main reasons for inappropriate days

cause of inappropriate episodes / medical management process	Total Inappropriate episodes/ mmp	Cause of inappropriate episodes			
		Internal cause to the ward	Internal cause to the hospit and external to the ward	External cause to the hospital	Cause linked with patient
Cutaneo-mucous Wound	1	1(100%)	0	0	0
Alcoholic detoxication	6	1 (16.7%)	1(16.7%)	1(16.7%)	3(50%)
Ablat oper equipment, short stay surgery	8	2 (25%)	1 (12.5%)	5 (62.5%)	0
Gastro-enterology	48	8 (16.7%)	23 (47.9%)	15 (31.2%)	2 (4.1%)
Simple fracture	19	5 (26.3%)	3 (15.8%)	11 (57.9%)	0
Int medicine (not ger)	21	3 (14.3%)	11 (52.4%)	7 (33.3%)	0
Complex fracture, long stay surgery	27	4 (14.8%)	3 (11.1%)	20 (74.1%)	0
Dem+ neuro-psy troubles	71	1 (1.4%)	18 (25.3%)	41 (57.7%)	11 (15.5%)
Dem + int med	132	9 (6.8%)	13 (9.8%)	84 (63.6%)	26 (19.7%)
Int medicine (ger)	91	1 (1.1%)	10 (11%)	56 (61.5%)	24 (26.4%)

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In table 2, four essential factors related with inappropriate days are presented.

Table 2 – four factors related with inappropriate days

MMP	Nr patients	Length of stay ok	Mean inappropriate days per MMP	Rate Inapdays/ total days	Rate sched uled admission
cutaneo-mucous Wound	21	2.95 (SD 1.8)	0.10 (SD 0.43)	0.06 (SD0.2)	0%
Alcoholic detoxication	32	7.9 (SD 3.4)	0.31 (SD0.86)	0.08 (SD 0.2)	84%
Ablat oper equipment, short stay surgery	68	4.00 (SD3)	0.41 (SD 1.5)	0.06 (SD 0.2)	99%
Gastro-enterology	59	8.5 (SD 6.5)	2 (SD 3.1)	0.22 (SD 0.3)	41%
Simple fracture	43	6.4 (SD 4.2)	1.7 (SD 2.2)	0.24 (SD 0.3)	26%
Int medicine (not ger)	23	8.7 (SD 5.2)	2.8 (SD 3.3)	0.4 (SD 0.4)	9%
Complex fracture, long stay surgery	42	13 (SD 7.9)	3.9 (SD 5.5)	0.26 (SD 0.3)	21%
Dem+ neuro-psy troubles	47	18 (SD 10)	12.8 (SD 9.1)	0.66 (SD 0.3)	5%
Dem + int med	86	16.9 (SD 13.7)	7.7 (SD 7)	0.46 (SD 0.3)	5%
Int medicine (ger)	56	16 (SD 14)	8.1 (SD 12.4)	0.42 (SD 0.3)	13%

Results of associations between factors at constant factor are shown in table 3

Table 3 – Associations at constant factor

Association between	test at constant factor - result
Medical Management Process & reason for inappropriateness	Inappropriate days $p<0.0001$
Medical Management Process & rate of scheduled admissions	Inappropriate days $p<0.0001$
Medical Management Process & rate of scheduled admissions	Length of stay $p<0.0001$
Medical Management Process & length of stay	Inappropriate days $p<0.0001$
Medical Management Process & inappropriate days	Ratio Inappropriate days /Total days $p=0.0063$
Medical Management Process & ratio Inappropriate days /Total days	rate of scheduled admissions $p<0.0001$
Medical Management Process & rate of scheduled admissions	Inappropriate days $p<0.0001$
Medical Management Process & rate of scheduled admissions	Length of stay $p<0.0001$
Medical Management Process & Inappropriate days	Reason for inappropriateness $p=0.05$
Reason for inappropriateness & rate of scheduled admissions	Medical Management Process $p=0.002$
Reason for inappropriateness & Inappropriate days	Medical Management Process $p<0.0001$
Inappropriate days & rate of scheduled admissions	Length of stay $p<0.0001$
Inappropriate days & ratio Inappropriate days /Total days	Length of stay $p<0.0001$

The processing of all (424) "groups of contiguous days related with the same reason for inappropriateness" by Multiple Correspondence Analysis (SAS V8.2 / PC) shows that 81% of the variance can be modeled in two axes. The first axis (63%) depends essentially on the appropriate setting of care (60%), rate of scheduled admission (21%), cause of inappropriateness (19%) while the second axis (19%) is essentially composed of the appropriate setting of care (53%), cause of inappropriateness (26%), rate of scheduled admission (21%).

Five P profiles of queues (Fig.1) were found:

P1 : very low rate of scheduled admissions, appropriate setting of care is at home with no help, cause of inappropriateness is internal to the ward (cutaneo-mucous wound),

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P2 : high rate of scheduled admissions, appropriate setting of care is at home with no help, cause of inappropriateness is external to the hospital (alcoholic detoxication and ablation of operative equipment),

P3 : low rate of scheduled admissions, very high rate of inappropriateness, appropriate setting of care is non acute medical ward, cause of inappropriateness is external to the hospital (dementia and neuro-psychic troubles, dementia and internal medicine, internal medicine in acute geriatrics).

P4 : low rate of scheduled admissions, appropriate structure is at home with help, internal cause to the hospital and external to the ward (gastro-enterology, internal medicine),

P5 : low rate of scheduled admissions, appropriate structure is at home with medical and paramedical help, external cause to the hospital (simple fracture or short stay surgery, complex fracture or long stay surgery).

4. Discussion

Computed factors for decision-makers.

We computed two supplementary factors for aid to decision.

"Relative weight of inappropriate days by reason for inappropriateness by functional unit" (total inappropriate days for this reason in this functional unit / total inappropriate days for all reasons in this functional unit). This relative weight gives a classification of reasons for inappropriate days from the "heavier reason" (reason that cumulates the biggest number of inappropriate days) to the « lighter one » (the smaller number).

"Relative weight of inappropriate days by Medical Management Process" by functional unit (total inappropriate days for this MMP in this functional unit / total inappropriate days for all MMPs in this functional unit). This relative weight gives a classification of medical management processes from the "heavier one" (medical management process that cumulates the biggest number of inappropriate days) to the "lighter one" (the smaller number).

A strategy for reducing inappropriate days

First, we recommend to collect information for evaluation of appropriate days and analysis of inappropriate days on the following factors: medical management and discharge processes, scheduled admission, reason for inappropriateness, rate of inappropriate days, length of stay, number of queues per patient.
Second to classify queues and medical management processes by "relative weight of inappropriate days".
Third, to launch "quality improvement projects" e.g. based on the Demming wheel to reduce inappropriate hospital days.

5. Conclusion

In this study, we showed that there are real associations (elimination of transitive associations) between five factors : medical management process and discharge processes, reason for inappropriateness, scheduled admission, rate of inappropriate days, length of stay.

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