

## ORIGINAL ARTICLE

# How a University Hospital improves its prevention performance: results of two biennial studies 2004-2006

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## Key words

Hospital • Prevention

## Summary

**Introduction.** Prevention is a legal obligation for French hospitals and should be systematically assessed.

**Aim.** To measure how a French University Hospital improved its prevention performance between two biennial prevention studies after incentives measures were applied.

**Methods.** 45 medical, obstetrical or surgical units were included. A doctor-nurse pair was free to select inpatients at random. 14 preventive procedures were evaluated: blood pressure check, measures of weight, height and body mass index, screenings for diabetes, cervix and breast cancers, tetanus and influenza immunizations, serologies of viruses, research for a prostatic and cognitive disorder and evaluation of alcohol and tobacco consumptions and addictions. Incentives measures for prevention were enacted during the same time.

**Results.** In 2004 and in 2006, respectively 253 inpatients and 243 inpatients were respectively included. Tetanus immunization

was checked in less than one tenth of cases in both the studies. Seven acts were performed more in 2006 and only body mass index was measured less.

**Discussion.** The results were encouraging but insufficient especially for tetanus immunization. Weight was measured more than body mass index, probably meaning that's weight and more precisely its variations are a better clinical sign. Bad results for tetanus immunization meant that incentive strategies only displayed within the hospital were ineffective. Lastly, two propositions were done to improve the questionnaire and the prevention performance: to add five preventive services and a medical file first page, common to all units, summing up all preventive procedures evaluated.

**Conclusion.** The ability of this University Hospital to improve its prevention performance answering to local incentive measures was weak. Another solutions need to be found.

## Introduction

Hospitals have an important role to play in prevention performance. In France, this role is reinforced by the law and especially by two articles of the Public Health Code (L6111-1 and L6121-1).

Our works came within the framework of two previous French studies, aiming to measure preventive services performed into hospital [1, 2]. These works revealed insufficient results and underlined the necessity of a better performance. Because of a special interest to research a strategy to improve prevention performed into hospital, two studies were conducted in 2004 and 2006 whereas different incentive measures for prevention were enacted within the hospital, within the region and nationally.

Our surveys aimed to measure preventive procedures performed into a University Hospital according to national preventive cares guidelines and to follow the evolution of performance in answer to incentive measures applied.

## Method

These surveys were observational studies, carried out in the French University Hospital of Clermont-Ferrand

in 2004 and 2006, were based on a questionnaire and targeted primary and secondary prevention.

## MEDICAL RECORD ASSESSMENT

Ours surveys were based on the examination of inpatient medical records by medical team itself. Two advices were given to them before they fill in the questionnaire: a doctor-nurse pair was needed and the inpatient exit letter had to be sent. The ethic committee of the hospital had accepted the protocol.

## ELABORATION OF THE PREVENTION QUESTIONNAIRE

The prevention questionnaire was based on those previously used during the first prevention study conducted in our university hospital from 12<sup>th</sup> November 2000 to 18<sup>th</sup> July 2001. This questionnaire has been elaborated following national preventive cares guidelines developed by the Ministry of Health, the French National Authority for Health and the National Public Health Insurance for salaried workers and the international preventive cares guidelines (especially those of the United State Preventive Services Task Force). The prevention committee designated by the hospital medical committee to manage the work at the hospital level has chosen the most relevant preventive procedures considering our activity and has built two questionnaires: one for adults

and one for children. Then, the two questionnaires were tested by the hospital public health team for its feasibility and reproducibility.

The questionnaires were developed on paper and measured three dimensions:

- the performance of a preventive procedure;
- the existence of a problem, previously known or not, which can be defined by an abnormality during a preventive procedure (such as high blood pressure or overweight) or the lack of a preventive service that can be performed out of the hospital (such as mammography, smear test or immunization);
- the transmission of an unknown problem to the patient or his family in case of cognitive disorder or to his general practitioner (GP) (Tab. I).

Fourteen preventive procedures were measured: blood pressure check, measures of weight, height and BMI, screenings for diabetes and cervix and breast cancers, research for a prostatic and a cognitive disorder, tetanus and influenza immunizations, serologies of hepatitis B and C viruses and Human Immunodeficiency Virus (HBV, HCV and HIV), evaluation of tobacco and alcohol consumptions and addictions.

For each preventive service, targeted inpatients, objectives and definition of the health disorder were precised (Tab. II).

**METHODS USED TO SELECT HOSPITAL UNIT AND MEDICAL RECORDS**

Data were collected by 15 doctors-nurses pairs that had to analyse medical records from different units. At the

Tab. I. Prevention questionnaire.

Unit:

Birth date:

Sex: Women ≤ Men ≤

Preventive service	Performance (1)	Problem (2) (if service was measured)	Transmission of the information (3) (if problem was unknown)
Blood pressure (min/max)	Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes known <input type="checkbox"/> Yes unknown <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Weight (kg)	Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes known <input type="checkbox"/> Yes unknown <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Height (cm)	Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes known <input type="checkbox"/> Yes unknown <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Body Mass Index	Value =	Yes known <input type="checkbox"/> Yes unknown <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Screening for diabetes	Yes <input type="checkbox"/> No <input type="checkbox"/> NC <input type="checkbox"/>	Yes known <input type="checkbox"/> Yes unknown <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Prostatic disorder	Yes <input type="checkbox"/> No <input type="checkbox"/> NC <input type="checkbox"/>	Yes known <input type="checkbox"/> Yes unknown <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Screening for cervix cancer	Yes <input type="checkbox"/> No <input type="checkbox"/> NC <input type="checkbox"/>	Yes known <input type="checkbox"/> No <input type="checkbox"/> Performed during hospitalization <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Screening for breast cancer	Yes <input type="checkbox"/> No <input type="checkbox"/> NC <input type="checkbox"/>	Yes known <input type="checkbox"/> No <input type="checkbox"/> Performed during hospitalization <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Tetanus immunization	Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes known <input type="checkbox"/> No <input type="checkbox"/> Performed during hospitalization <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Influenza Immunization	Yes <input type="checkbox"/> No <input type="checkbox"/> NC <input type="checkbox"/>	Yes known <input type="checkbox"/> No <input type="checkbox"/> Performed during hospitalization <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Serologies of viruses (HBV, HVC and HIV)	Yes <input type="checkbox"/> No <input type="checkbox"/> NC <input type="checkbox"/>	Yes known <input type="checkbox"/> Yes unknown <input type="checkbox"/> No <input type="checkbox"/> Performed during hospitalization <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Cognitive disorder assessment	Yes <input type="checkbox"/> No <input type="checkbox"/> NC <input type="checkbox"/>	Yes known <input type="checkbox"/> Yes unknown <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Alcohol consumption assessment	Yes <input type="checkbox"/> No <input type="checkbox"/> NC <input type="checkbox"/>	Yes known <input type="checkbox"/> Yes unknown <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Tobacco consumption assessment	Yes <input type="checkbox"/> No <input type="checkbox"/> NC <input type="checkbox"/>	Yes known <input type="checkbox"/> Yes unknown <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>

NC: Not Concerned

HBV: Hepatitis B virus

HCV: Hepatitis C virus

HIV: Human Immunodeficiency Virus

1) Performance: information noted in medical or nursing records, in enter or exit letters or in any documents classified into the records,

2) Problem : noted especially when it was performed during the hospitalization for screenings for cervix and breast cancers, immunizations and serologies of viruses,

3) Transmission: noted only if a problem identified previously was unknown. It concerned advices given to inpatient or his family in case of cognitive disorder, wrote in medical records or information noted in exit letter with a copy jointed in the records.

**Tab. II.** Preventive services, targeted inpatients, objectives and health disorder evaluated in the two biennial studies.

Preventive services	Targeted inpatients	Objectives	Problem
Blood pressure	All patients	One measure during the hospitalization	Systolic Blood Pressure > 140mmHg Diastolic Blood Pressure > 90mmHg
Weight Height Body Mass Index (BMI)	All patients	One measure during the hospitalization	BMI < 21kg/m <sup>2</sup> : undernourishment BMI > 28kg/m <sup>2</sup> : overweight BMI > 33kg/m <sup>2</sup> : obesity
Screening for diabetes	Patients ≥ 45 years old and with another cardiovascular risk factor	Date of the last screening was under 3 years	Sugar blood sample > 1,2g/l (6,7mmol/l) if last lunch > 2 hours Sugar blood sample > 1,5g/l (8,4mmol/l) if last lunch < 2 hours
Prostatic disorder	Men > 70 years old	Date of the last clinic exam	Less than 1 clinic exam (interrogation and rectal touch) during the last year
Screening for cervix cancer	20 years old ≤ Women ≤ 70 years old	Date of the last smear test	Less than 1 smear test during the last 3 years
Screening for breast cancer	50 years old ≤ Women ≤ 69 years old	Date of the last mammography	Less than 1 mammography during the last 2 years
Tetanus immunization	All patients	Date of the last vaccine	Last immunization > 10 years
Influenza immunization	Patients ≥ 65 years old between October and December	Date of the last vaccine	Last immunization > 6 months
Serologies of viruses (HIV, HBV, HCV)	Patients with a medical history of an important operation or blood transfusion	To perform serologies according to the patient medical history	no test performed according to the patient medical history
Cognitive disorder assessment	Patients > 60 years old	Performed a MMSE or an IADL	Last MMSE or IADL not performed during the last year
Alcohol consumption assessment	Patients > 12 years old	To ask and to notice consumption	Last CAGE test or specialize evaluation not performed during the last year
Tobacco consumption assessment	Patients > 12 years old	To ask and to notice consumption	Last consumption noticed in number of packet/year or cigarettes/day And if the patient was a smoker, last Fagerström test not performed during the last year

HIV: Human Immunodeficiency Virus

HBV: Hepatitis B Virus

HCV: Hepatitis C Virus

MMSE: Minimal Mental State Examination

IADL: Instrumental Activities of Daily Living

CAGE: Cut down Annoyed Gully Eye-opener

same time, they also had to check the quality of medical and nursing data for another inquiry related to the accreditation process. The doctor-nurse pairs have to select the medical record at random and were trained to it but the randomization process had not controlled after selection. Laboratory, technical, social and physiotherapists units and the palliative care unit were excluded.

### INCENTIVE MEASURES DISPLAYED

Five kinds of incentive measures for prevention were displayed within the hospital. Firstly, results were sent to all doctors and to chief nurses of each unit. To help them to compare their own results, hospital units were divided into three groups: medical, surgical and obstetrical. For each unit and for each preventive service, means were presented and compared to the means of their group. Secondly, during the working accreditation group meetings, results were presented and explanations were given about prevention aim and hospital missions. Thirdly, global results were transmitted to the hospital's board of directors. Fourthly, two articles about the 2004 study's prevention aims and results were published in the hospital journal. Finally, annual campaigns encouraging influenza vaccination were led. Incentive measures were also developed both at the regional and the national levels. Regional public health

insurance waged a campaign for breast cancer screening. Nationally, campaigns for screenings of virus infections (HBV, HCV and HIV), cognitive disorders (Alzheimer disease prevention program), tobacco and alcohol consumptions and influenza immunization was launched as well as the second part of the Nutritional Health National Program.

### STATISTICAL ANALYSIS

Our statistical analysis used the SAS software. Means, measuring how each preventive procedure was performed in the units, were calculated. Then, a means comparison for the two independent samples (2004 and 2006) based on the Student test were performed with a meaningful threshold of 5%. At last, to sum up findings, two scores were calculated: measure score and information score. Formulas for means and these two scores are introduced in appendix.

### Results

Forty five units participated to ours studies. In 2004 and in 2006, respectively 253 patients (112 women and 141 men) and 243 patients (127 women and 116 men) were

included. The two samples were comparable in terms of age, sex and medical units.

In 2004, three preventive services were measured more than 70% of cases: blood pressure check, screening for diabetes and measure of weight. Four procedures were evaluated in less than one tenth of cases: tetanus and influenza immunizations and screenings for cervix and breast cancers. When an unknown BMI disorder was found, information of the patient or his GP was systematic. This communication has been realized in three-quarter of cases when an unknown cognitive disorder was diagnosed but never in case of alcohol addiction.

In 2006, the same three preventive services were performed in more than 80% of cases and only tetanus immunization remained measured in less than one tenth of cases. Same findings were noticed for information of the patient or his GP concerning unknown BMI and cognitive disorders. No writes were transmitted when a prostatic trouble was identified.

Seven preventive procedures were performed more in 2006 than in 2004: measure of weight, screening for cervix cancer, influenza immunization, serologies of viruses, research for a cognitive disorder and evaluation of alcohol and tobacco consumptions. Only BMI was checked less in 2006 than in 2004.

Unfortunately, only the adults' questionnaire was analysed because two paediatrics units were included resulting in very few data available and data were insufficient to perform statistical tests for information means (measure k). Results are presented in Table III.

## Discussion

### GLOBAL RESULTS

Seven preventive services were performed more in 2006 than in 2004 among the 14 procedures evaluated. Nonetheless, results for tetanus immunization remained at an extremely low level meaning that incentive measures exclusively displayed within the hospital have no impact on prevention performance. On the contrary, when incentive measures are jointly developed at the regional or at the national level, a meaningful enhancement was found.

BMI was the only service on the decrease in 2006 whereas measure of weight was higher. We can explain these findings by the fact that weight and especially loss of weight on a period of time is a better clinical sign of health disorders than BMI for a lot of pathologies like heart failure or cancers. We also hypothesized that doctors measure BMI only if they think that weight according to height is abnormal. Moreover, transmission of a problem unknown to the patient himself or his GP was weak. Finally, results were encouraging but remained insufficient especially for tetanus immunization.

### COMPARISONS WITH OTHERS STUDIES

Concerning tetanus immunization rate, two previous French Studies have produced the same findings [3, 4]. Furthermore, there were two works, previously cited in introduction, which had already measured prevention performed at hospital [1, 2]. The first one, conducted in Paris by Lombrail et al. [1] in 1988, revealed that tetanus immunization was already neglected. Concern-

Tab. III. Means comparisons of preventive services performed in 2004 and 2006.

Preventive services	Year 2006			Year 2004			d = m2006-m2004	p-value
	N	means	95% CI	N	means	95% CI		
Blood pressure	262	95	[93; 98]	277	94	[91; 96]	1	NM
Weight	264	82	[77; 87]	277	70	[65; 75]	12	0.0009
Height	258	45	[39; 51]	275	39	[33; 45]	6	NM
Body Mass Index	117	22	[15; 30]	108	39	[30; 48]	-17	0.0064
Screening for diabetes	254	80	[75; 85]	248	79	[74; 84]	1	NM
Prostatic disorder	85	27	[17; 37]	116	28	[19; 36]	-1	NM
Screening for cervix cancer	83	23	[14; 32]	86	5	[0; 9]	18	0.0006
Screening for breast cancer	82	20	[11; 28]	85	9	[3; 16]	11	NM
Tetanus immunization	259	7	[4; 10]	264	8	[5; 11]	-1	NM
Influenza immunization	164	25	[18; 32]	143	4	[1; 8]	21	< 0.0001
Serologies of viruses	156	39	[31; 47]	181	25	[19; 31]	14	0.0049
Cognitive disorder assessment	197	43	[36; 50]	180	31	[24; 37]	12	0.0151
Alcohol consumption assessment	215	40	[33; 46]	242	25	[20; 31]	15	0.001
Tobacco consumption assessment	223	55	[48; 61]	249	45	[38; 51]	10	0.028

NS: Not Meaningful

CI: Confident Interval

N: Number of medical record included

ing screenings for cervix, breast and prostatic cancers, their findings were not meaningfully different than ours. The second study, performed by Grondin et al. [2] at the University Hospital of Auvergne in 2000, has also measured low tetanus coverage. Concerning blood pressure check and screening for diabetes, their findings are comparable to ours. Between 2000 and 2006 studies, two preventive procedures; influenza immunization and serologies of viruses, have increased (p-value < 0.0001). On the contrary, the research for a cognitive disorder has decreased (p-value = 0.0014).

### IMPROVEMENT PROPOSITIONS

Finally, we have proposed two enhancement solutions. Firstly, we have suggested the creation of a specific first page of the medical record, common to all units, summing up all preventive services evaluated, with two possibilities at the end: procedures could be performed during hospitalization or could be noticed in the exit letter to be performed later by the patient's GP. We also suggested the addition of five services according to the French National Authority for Health new preventive cares guidelines: screenings for undernourishment using Minimal Nutritional Assessment [5], dyslipidemia [6] and colorectal cancer using faecal occult blood sample [7-10] and rubella and toxoplasmosis serologies for fertile and nullipara women [11, 12].

### Strengths and limitations

The protocol for selection of medical records has been followed and samples included were comparable. The strength of ours surveys was a collect of data based on what the doctors have noticed in medical records. Ours

studies had one main limitation; medical records were selected by a doctor-nurse pair and randomization process during this selection was not controlled implying that only the best records were selected. However, the teams were trained to select at random and they checked records for units in which they were not working. On the whole, our results are poor enough to avoid any risk of wrong reassurance about prevention performance. We did not checked patients preference about their value in prevention but our main goal was more to give information to the patient than to realize preventive cares during the hospitalization.

### Conclusion

Prevention performance at hospital remained insufficient despite an improvement of seven preventive procedures among the 14 services evaluated. The widest gap between practice and guidelines has been identified for tetanus immunization. Moreover, these studies have also demonstrated that communication between doctors at hospital and the patient himself or his GP was weak. Tetanus immunization was the only preventive service for which there is no local or national campaign led. Therefore, incentive strategies exclusively developed within the hospital were ineffective.

In conclusion, an improvement solution suggesting the creation of a medical record first page, common to all units, summarizing all the preventive services evaluated and giving the possibility to notice procedure which could be performed later by GPs, has been proposed. It would be interesting to see how this proposition could be established according to each unit specialty and to continue our prevention analysis at the GPs' surgery.

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## Appendix

The formulas of mean and 3 scores: measure, information and total scores, are presented here:

- **Measure Score:**

We have measured if the 14 preventive services were evaluated and noticed in the inpatients medical record.

N: number of inpatients

i: inpatient such as  $1 \leq i \leq N$

j: Preventive service such as  $1 \leq j \leq 14$

$X_{i,j}$ : Result for preventive service j for the inpatient i  
(100: preventive service was done and noticed; 0: not done)

$M_{Xi,j}$ : Numbers of answers obtained for  $X_{i,j}$   
(1: questionnaire was filled in; 0: not filled in)

$$\text{Measure } j \text{ (means)} = \frac{\sum_{i=1}^N X_{i,j}}{\sum_{i=1}^N M_{Xi,j}} \quad \text{Measure Score} = \frac{\sum_{j=1}^{14} \sum_{i=1}^N X_{i,j}}{\sum_{j=1}^{14} \sum_{i=1}^N M_{Xi,j}}$$

- **Information Score:**

12 problems were defined. Our interest was focused on the transmission of information between the hospital and the patient himself or his GP when an unknown problem was identified during the hospitalization.

i: inpatient such as  $1 \leq i \leq N$

k: transmission of an unknown problem such as  $1 \leq k \leq 12$

$Y_{i,k}$ : Result for transmission of the information of an unknown problem to patient or his GP for the inpatient i  
(100: unknown problem was identified and transmitted; 0: not identified or not transmitted)

$M_{Yi,k}$ : Numbers of answers obtain for  $Y_{i,k}$   
(1: questionnaire was filled in; 0: not filled in)

$$\text{Measure } k = \frac{\sum_{i=1}^N Y_{i,k}}{\sum_{i=1}^N M_{Yi,k}} \quad \text{Information Score} = \frac{\sum_{k=1}^{12} \sum_{i=1}^N Y_{i,k}}{\sum_{k=1}^{12} \sum_{i=1}^N M_{Yi,k}}$$

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