ORIGINAL ARTICLES

# Trends in avoidable hospitalization rates in Italy, 2001-2008

ALDO ROSANO[(1)], ANTONIO GIULIO DE BELVIS[(2)], ANTONELLA SFERRAZZA[(2)], ALESSANDRA BURGIO[(3)], WALTER RICCIARDI[(2)], JOUKE VAN DER ZEE[(4)]

## ABSTRACT

**BACKGROUND:** hospitalization for Ambulatory Care Sensitive Conditions (ACSC), also known as avoidable hospitalization (AH) has been proposed as effect measure of the accessibility and effectiveness of primary care. In the last years in developed countries, including Italy, hospitalization rates have decreased as well as the rates of AH. The decline of AH-rates could be just an effect of the general trend of hospitalization. The objective of our study was to examine the adjusted trend of AH rates and to test possible associations with measures of primary care (re)organization.
**METHODS:** hospital discharges from 2001 to 2008 were analyzed. Main outcome measures were hospitalization rates, both as inpatient and day hospital. ACSCs were grouped in acute conditions, preventable through early diagnoses and treatment and chronic conditions, preventable through good ongoing control and management. Expected time-series rates of AH, estimated on the hypothesis of same time trends of Total Hospitalization (TH), were compared with observed ones using a Chi Square test. Adjusted hospitalization rates were analyzed in conjunction with indicators of primary care.
**RESULTS:** in the studied period, in Italy, the TH rates declined with an average decrease of 19.6%, while the decrease for AH was 16.4%. The rates of AH adjusted for the trend of TH significantly decreased only for chronic conditions. Decreasing trend of AH was correlated with the impact of reorganization of primary care in associative forms.
**CONCLUSIONS:** the presented methodology can be used to evaluate the real effectiveness of policies aimed at reducing hospitalization for ACSCs.

*Key words: Avoidable hospitalization; Primary care; Time trends*

(1) LazioSanità, Agency of Public Health, Rome, Italy
(2) Department of Public Health and Preventive Medicine, Università Cattolica del Sacro Cuore, Rome, Italy
(3) National Institute of Statistics, Rome, Italy
(4) Department of International Health, Maastricht University, the Netherlands

*CORRESPONDING AUTHOR:* Aldo Rosano, LazioSanità, Agency of Public Health, Via di Santa Costanza 53, 00198 Rome, Italy. Tel: +39 06 83060378, Fax: +39 06 83060463. e-mail: rosano@asplazio.it

## INTRODUCTION

Many diseases, both chronic and acute, once treated in hospital, can now be more appropriately handled in primary care [1]. This results in a benefit, both for patients and hospital organization, which can be better devoted to urgent and intensive care. Potentially avoidable hospitalization (AH) refers to a hospitalization for conditions which could be appropriately and timely prevented or treated through the management and control in a less intensive level of care. Those conditions are known as Ambulatory Care Sensitive Conditions (ACSC) [2].

Admissions for ACSCs represent a distinct health outcome from inappropriate admissions, defined as admissions for problems that could be treated on an outpatient basis [3]. It is about events for which the appropriateness of admission itself is not questionable, but the fact that the patient could avoid the recourse to the hospital if he/she had been adequately treated by primary care services [4].

It has been shown that patients who have better access to primary care are less likely to be hospitalized for ACSCs [5-9]. The hospitalization rate for AH has been suggested as a measure of prompt access and quality of outpatient care and, in general, of primary care [10].

Hospitalization rate for ACSCs can be used to evaluate Primary Health Care's (PHC) capability to solve health problems, although the expected effect on potentially avoidable hospitalizations will differ depending on the conditions being treated. Hospitalizations should be essentially eliminated for diseases that can be prevented either by early diagnosis and treatment of the disease precursor (e.g. rheumatic fever) or at the early stages of the natural course of the disease (e.g. pelvic inflammatory disease). On the other hand, for chronic conditions the most immediate result should be the decline of the occurrence of acute complications (e.g. coma in diabetic patients) [11].

Thus, ACSCs are used to be grouped in two different lists of conditions: the first includes conditions that are supposed to be prevented through early diagnoses (and treatment) of the condition or its precursor; the latter through good ongoing control and management.

The extent to which differences in rates of ACSC hospitalizations is associated with differences in the strength of the PHC organization appears to be worth exploring, since these hospitalizations have been considered a potential effect of the quality of PHC received. In Italy, hospitalization rates for ACSCs have decreased in the last years [12] as well as total hospitalization (TH) rates and it is not immediate to distinguish the factors influencing independently AH from TH.

Day-hospital (DH) admissions are used for interventions or procedures to treat acute or chronic conditions which do not require a overnight stay in hospital. In the past DH admissions has been often used also for diagnostic purposes, specially for complex chronic conditions. The shift to day hospital admissions is used as an indicator of the evaluation of the hospital care [13]. In more recent years, many regions have moved all diagnostic procedures to the ambulatory setting. Therefore DH admissions may have played a role in the process of de-hospitalization, particularly for chronic diseases.

The number of General Practitioners (GPs) per 1 000 residents and the number of ambulatory visits per 1 000 residents has been widely used to analyze the relationship between AH and accessibility of primary care [14].

Since 2000 an innovative form of primary care delivery has been developing: the primary care in association. It is constituted by a pool of GPs who decide to share structures, facilities and decide to collaborate in common projects. The main benefits that medicine in association guarantees can be summarized in: continuity of care; availability of GPs for more hours per day and days per week; adherence to guidelines and innovative projects; prevention of avoidable access to E&A and hospital admissions The percentage of GPs involved in associative network increased (nationwide) in the study period (from 59% in 2004 to 65% in 2009), especially in Tuscany, Campania, Lombardy and Abruzzo [15].

Several factors are known to be associated with the occurrence of AH, such as socioeconomic status of patients and the prevalence of the disease [16]. They are not supposed to change significantly over the eight years under analysis and thus were not considered in the present study.

The goal of the study was to examine the trend of hospitalization rates for AH in Italy and to verify to which extent the trend was attributable to reduction in hospital use or to specific factors underlying the AH. We also tested the relationship between hospitalization rates for AH and indicators of primary care access, by investigating whether new measures of health care management, specifically delivering primary care by GPs in associative form, have had an impact on overall hospitalization and/or specifically on AH.

## MATERIAL AND METHODS

### Sources of data

Hospitalization data were collected, in aggregate, from the archive of hospital discharge

records of the Ministry of Health and refer to discharges registered between January 1, 2001 and December 31, 2008. Population data for the years 2001-2008 were extracted from the archive available online by the National Institute of Statistics - ISTAT [17]. Information on primary care delivery (number of GPs per 1 000 residents, number of diagnostic imaging tests per 1 000 residents, proportion of GPs in association) was drawn from the Osservasalute database [18].

### Selection of diagnoses

For the purposes of the study 59 374 201 discharges in acute care wards referred only to patients aged over 18 years were selected. Admissions for DH were also separately investigated. The choice of not including pediatric admissions is due to the fact that it is difficult to argue the avoidability of hospitalization among children whether this is the case of the first event to be treated in emergency, that only subsequently would require a follow-up and clinical care as outpatient, such as for episodes of asthma.

The selection of diagnoses for ACSC was conducted according to the criteria defined in a previous study [19], where those selected in the American [2] and European [20] context were adapted to the Italian one. The selected ACSCs are reported in Table 1, classified according to two different strategies of prevention: early diagnoses and treatment of the condition (acute conditions - group 1); appropriate follow-up and good management of chronic disease (chronic conditions - group 2).

### Statistical analysis

We calculated the age-standardized rates per 1 000 persons of avoidable hospitalizations (ASAH). Denominators consisted in the population at the beginning of the reporting year. The reference standard population was the resident population in Italy on January 1st, 2005. To take into account the propensity to hospitalization, the expected rates of avoidable hospitalizations adjusted for the general trend of hospitalization were calculated. The expected rates of AH were estimated for the years 2002-2008 on the basis of the percentage annual variations observed in the

time series of TH rates. The trends of observed/expected rate ratio were then analysed using the non-parametric test for the analysis of trend developed by Cuzick [21], which is an extension of the rank test proposed by Wilcoxon. The level of significance was set at 5%.

Joinpoint regression analyses (version 2.7) [22] were used to assess changes in ASAH, as well as TH, both as inpatient admissions and DH, over time. This procedure, also known as piecewise or segmented regression, fits a model based on the minimum number of joinpoints (points of change in slope) that are observable across a series of rates over time. The unit of analysis is the year, with eight data points being represented (i.e., 2001-2008). Hospitalization rates by year were then analyzed in relationship with the primary care indicators (number of GPs, number of diagnostic imaging tests and percentage of GPs in association) using a non parametric correlation index: the Spearman index (S-index).

## RESULTS

In the study period, about 4.8 million hospital admissions for ACSCs were registered in Italy, accounting for 8% of total hospitalization. The decrease in the overall rate of hospitalization in the period 2001-2008 was 19.6%, while that for avoidable conditions was 16.4%; rates of DH hospitalization increased from 58 per 1 000 in 2001 to 69 per 1 000 in 2005 and then decreased to 59 per 1 000 in 2008 (Figure 1). The trend of AH rates, when adjusted for general hospitalization, did not reveal any significant slope (p>0.05). If we consider separately hospitalization rates for avoidable acute and chronic conditions, the trend of adjusted rates was slightly increasing for acute conditions and decreasing for chronic conditions.

According to the joinpoint regression results, as for TH, the trend is towards significantly decreasing rates with no significant joinpoint (JP) throughout the time interval (JP=0, slope= -0.049, p<0.05). The AH rates depict the same trend, showing statistically significant declines, with no significant joinpoint throughout the time interval (JP=0, slope= -0.025, p<0.05) (data not shown). When analyzing AH for chronic conditions we found a significant decrease with one significant joinpoint at year 2005 (JP=1,

**TABLE 1**

| LIST OF AMBULATORY CARE SENSITIVE CONDITIONS: DEFINITIONS, CODES AND EXCLUSION | | |
|---|---|---|
| **ACS CONDITIONS BY GROUP** | **ICD-9-CM CODES** | **EXCLUSION** |
| **GROUP 1 - CONDITIONS PREVENTABLE THROUGH EARLY DIAGNOSIS AND TREATMENT** | | |
| A1: Nutritional deficiency | 260, 261, 262, 268.0, 268.1 | |
| A2: Disorders of hydro-electrolyte metabolism | 276.5, 276.8 | |
| A3: Pneumonia | 481, 482.2, 482.3, 482.9, 483, 485, 486 | Excluded cases with sickle cell anaemia (282.6) as secondary diagnosis |
| A4: Bleeding of perforating ulcers | 531.0, 531.2, 531.4, 531.6, 532.0, 532.2, 532.4, 532.6, 533.0, 533.2, 533.4, 533.6 | |
| A5: Appendicitis with complications | 540.0, 540.1 | |
| A6: Urinary tract infections | 590.0-590.9, 595.0, 595.9, 599.0 | |
| A7: Pelvic inflammatory disease | 614 | |
| **GROUP 2 - TREATABLE CONDITIONS THROUGH GOOD ONGOING CONTROL AND MANAGEMENT** | | |
| B1: Diabetes | 250.0-250.9, 251.0, 785.4 + 250.7 | |
| B2: Amputation of lower limbs in patients with diabetes | 84.10-84.19 + 250.0-250.9 | Excluding amputation for trauma (895, 896,897) |
| B3: Hypertension | 401.0, 402.0,403.0, 404.0, 405.0, 437.2 | Excluding cases with cardiac surgical procedures (35, 36, 37.31-37.35, 37.5-37.54, 37.7-37.8, 37.94-37.98) |
| B4: Angina pectoris | 413 | Excluding cases with cardiac surgical procedures (35, 36, 37.31-37.35, 37.5-37.54, 37.7-37.8, 37.94-37.98) |
| B5: Heart failure | 428, 518.4 | Excluding cases with cardiac surgical procedures (35, 36, 37.31-37.35, 37.5-37.54, 37.7-37.8, 37.94-37.98) |
| B6: Asthma | 493 | |

slope 2000-2004= -0.26, slope 2005-2008= -0.21, $p<0.05$) (Figure 2a) as well as for hospitalization rates for DH (JP=1, slope 2000-2003= 5.09, slope 2004-2008= -2.08, $p<0.05$) (Figure 2b).

### Primary care delivery in association and adjusted rates of avoidable hospitalization

We tested the correlation between hospitalization rates time series both for ACSCs, separately for acute and chronic conditions, and total hospitalization (separately for inpatient and DH admissions) with the percentage of GPs in association, the number of GPs, the number of diagnostic imaging tests. We found a significant correlation between hospitalization rates and the percentage of GPs in association increasing in time for avoidable chronic conditions (from S-index= -0.35 in 2001 to S-index= -0.49 in 2008), decreasing for avoidable acute conditions (from S-index= -0.42 in 2001 to S-index= -0.22 in 2008).We also found a significant inverse correlation between the number of imaging diagnostic tests and the rates of hospitalization for avoidable chronic conditions (from S-index= -0.49 in 2001 to S-index= -0.40 in 2008).

### DISCUSSION

The study aimed at analyzing the trend of AH rates in the period from 2001 to 2008, adjusted for the tendency of general

FIGURE 1

**OVERALL STANDARDIZED RATE OF INPATIENT HOSPITALIZATION (TH) AND DH AND STANDARDIZED RATE OF HOSPITALIZATION FOR PREVENTABLE CONDITIONS (AH) PER 1 000 PERSONS. YEAR 2001-2008**
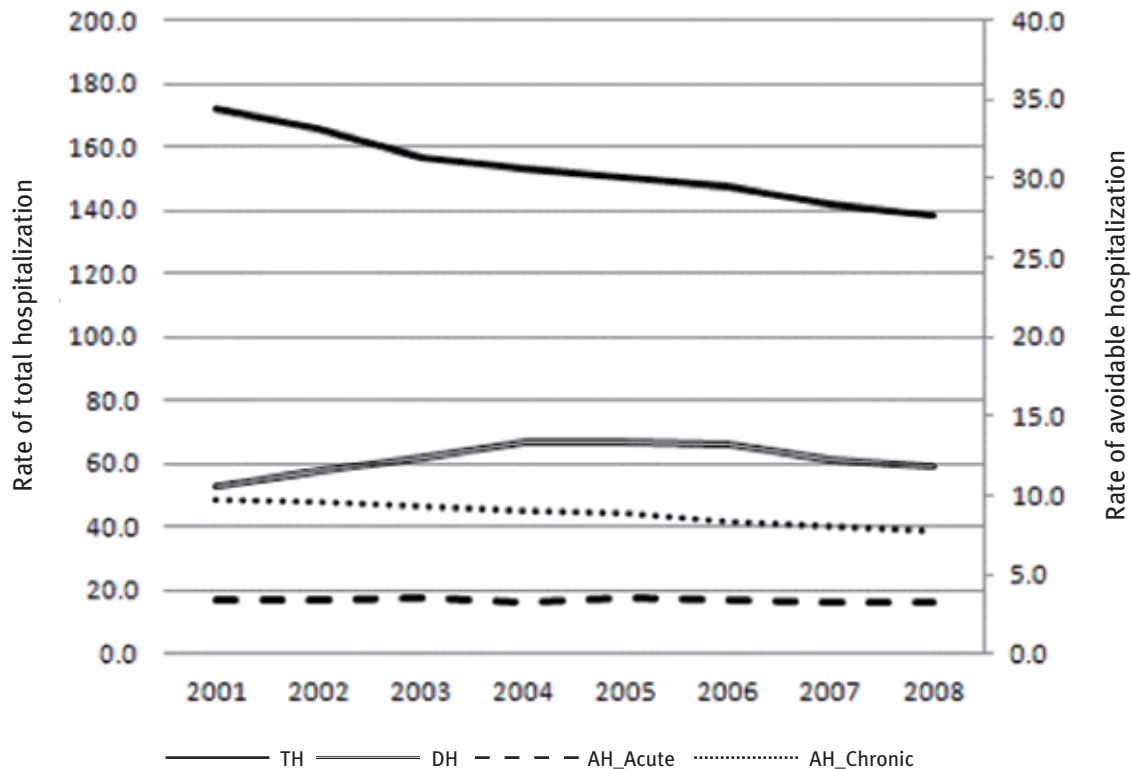


Source: Ministero della Salute. SDO - Istat. www.demo.istat.it. Anno 2010

hospitalization, in order to disentangle what happens in AH from general hospitalization.

The hospitalization for ACSCs can be used to interpret the capacity to provide good quality primary care and ensure continuity of care through a more effective and appropriate management of diseases in order to avoid complications and exacerbations of diseases. Generally speaking, even though non-avoidable hospitalizations constitute the majority of hospitalizations (i.e. around 92%) with AH constituting the remaining 8% of hospitalizations, in absolute terms the phenomenon of avoidable hospitalization has a considerable dimension: 4.8 million admissions in the eight years analyzed, for an average of about 600 000 admissions per year. As well as general hospitalization, avoidable hospitalization showed a decrease in the studied period, although less marked than general hospitalization.

Looking at AH we observed that acute avoidable conditions and chronic conditions showed different patterns: slightly increasing the first, decreasing, even if not significantly, the latter. The decrease in AH rates was due mainly to the sharp reduction of the number of admissions for diabetes (-40%), angina pectoris (-37%) and BPCO (-32%).

The breaking point of the AH rate at the year 2005 could be interpreted in conjunction with the increase of admission for DH observed until 2005 and the drastic drop afterward. Rates of inpatient hospitalization can decrease through higher DH use, specially for those conditions once treated as inpatients and then transferred in DH. It is about conditions and procedures (e.g. diagnosis of chronic diseases) that often coincide with ACSCs. The introduction of limitations for the admission in overnight stay of a list DRGs (see DPCM 29/11/2001 on the "essential levels of care" [Livelli Essenziali di Assistenza], that specifies which benefits are guaranteed by the National

**FIGURE 2a**

**JOINPOINT REGRESSION BEST-FIT LINES FOR AVOIDABLE HOSPITALIZATION RATES FOR CHRONIC CONDITIONS. RATES PER 100 000. YEAR 2001-2008**
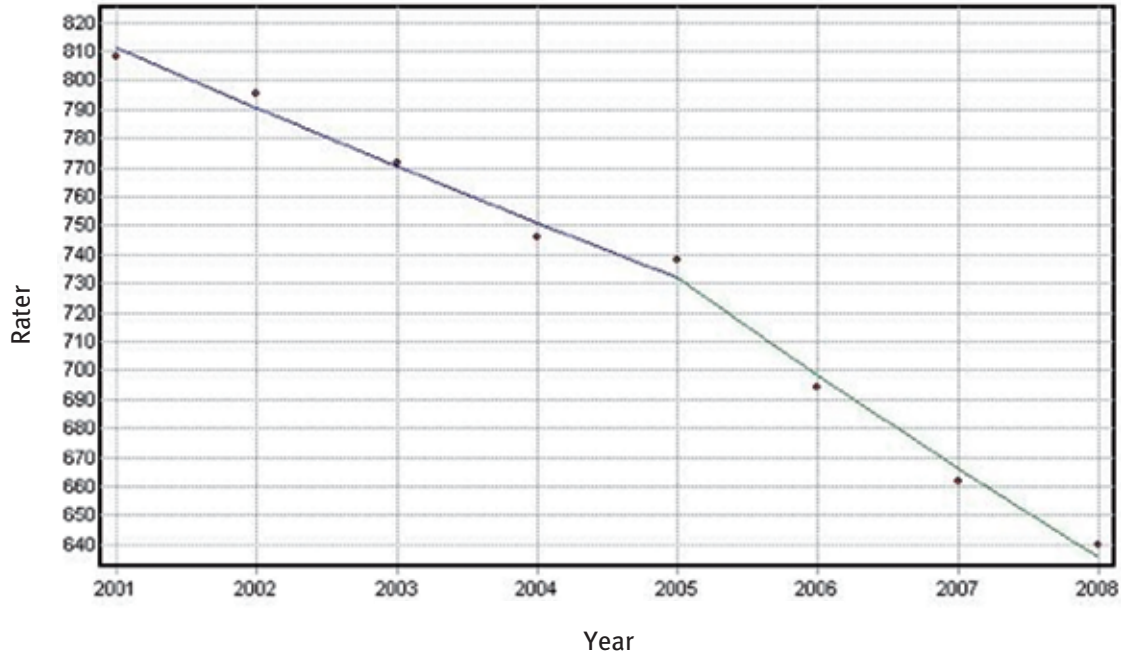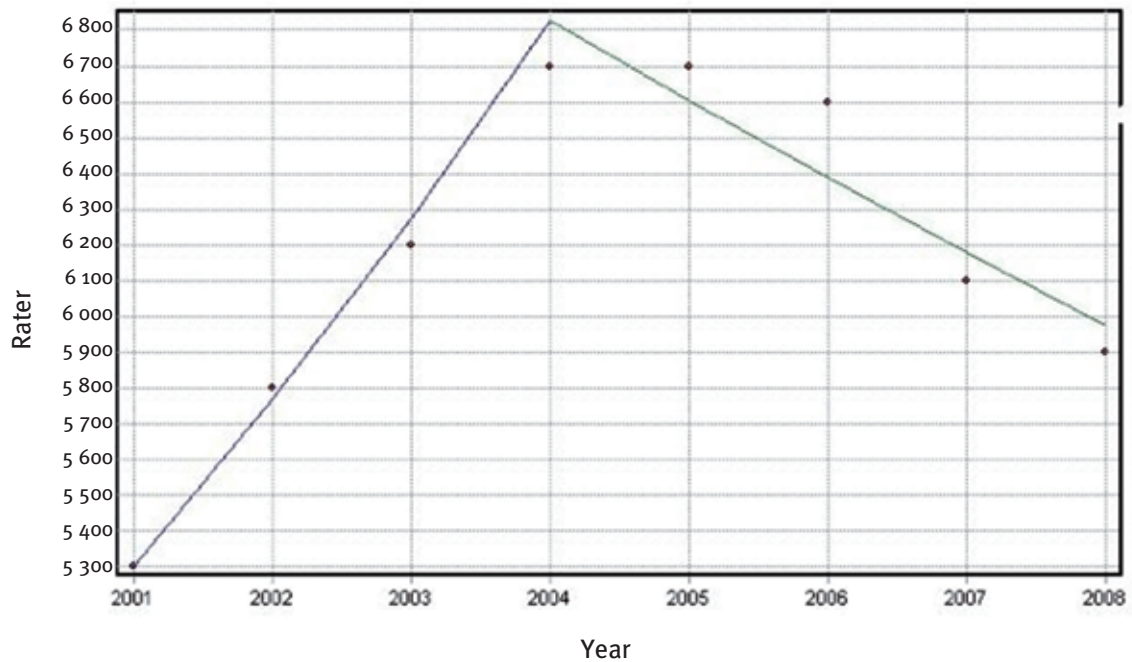


**FIGURE 2b**

**JOINPOINT REGRESSION BEST-FIT LINES FOR DH. RATES PER 100 000. YEAR 2001-2008**



Health Care System in terms of positive list and negative list, in primary, secondary and tertiary care, respectively) induced the shift to DH care setting. This may explain to some extent the sharp decrease of admissions of AHR for chronic conditions found in the joinpoint regression

analysis, with the peak in 2005. The percentage of admissions for DH was 25% in 2001, became 32% in 2005 and then decreased to 29% in 2009 [23]. The decrease of DH admissions observed after 2005 is attributable to the introduction of regional rules that authorized the provision in the ambulatory setting of DRGs included in the 2001 DPCM's list [24].

A particular consideration should be given to whether a higher proportion of current DH care could be delivered in alternative, less complex settings. An examination of this should ensure care to be delivered in the most clinically appropriate and cost-effective setting, enhancing primary care capacity to treat chronic and acute avoidable conditions.

The present study allowed to highlight the changes in the access to hospital for potentially preventable causes that it is more likely attributable to an increase in efficiency of primary care, depurating the trend of AH rates from the factors generating the trend of general hospitalization rates. A similar approach was used by Clouthier-Fisher and colleagues [25], who tried to analyze what happened in British Columbia (Canada) with avoidable hospitalization rates (AHR), comparatively to non-avoidable hospitalization rates (non AHR) and total hospitalization rates (THR), over the period 1990-2000. Comparing the slopes of trends across categories (AHR, non AHR and Total HR) the authors found statistically significant declines in all hospitalizations (both avoidable and non-avoidable) over the time period. However when comparing total AHRs to total non-AHRs the difference in slopes was not significant.

In the study period, in Italy has been growing a new organization of primary care delivery, called "primary care in association". By analyzing the correlation between the proportion of GPs in association and the time series of hospitalization rates (total, avoidable acute conditions, chronic avoidable conditions) we observed a significant correlation, both with avoidable acute conditions and with avoidable chronic conditions.

Limitations of our study derive from the fact that factors which may be independently associated with the risk of hospitalization regardless of primary care provision, such as comorbidities, characteristics of the population, of patients, of the health care organization, were not considered. Further limitations may derive from coding procedure of diagnoses, which may vary along the years [26]. This may cause some bias in the interpretation of time variability. In addition, no further information are available on the size and the form of "primary care in association" (peer networks, wired networks, co-working).

The analysis allows, even with reported limitations, some considerations about the trend of AH rates, taking into account an important element of context, such as the propensity to use the hospital setting for the care of patients. The decline in AHRs for chronic conditions may be interpreted in a positive light, suggesting that access to effective primary care is improving.

In terms of efficiency, the decline of hospitalization rates (ie, AHR, and non-AHR and Total HR) also suggests the possibility that the costs were reduced in the acute care sector. On the system perspective, it may be that any savings due to declining admissions are a product of smaller capacity (ie. fewer beds), however the health status of Italian population seem not to be affected. In a system where the access to health service is more balanced, with patients treated in the appropriate setting, everybody benefits and saved costs may make available resources to provide more preventive care and for medical research.

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