Health Policy 117 (2014) 90–97

Contents lists available at ScienceDirect

Health Policy

journal homepage: www.elsevier.com/locate/healthpol

Traveling for care: Inter-regional mobility for aortic valve substitution in Italy

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ARTICLE INFO

Article history:
Received 5 August 2013
Received in revised form 6 December 2013
Accepted 7 March 2014

Keywords:
Patients' mobility
Cross-border healthcare
Equity
Italy
DRGs

ABSTRACT

Patient flows across the regions of the Italian National Health Service can shed light on patient mobility, including cross-border flows within the European Union. We used 2009 data on 11,531 NHS admissions for aortic valve replacement operations to measure the extent of inter-regional patient mobility and to determine whether resident and non-resident patients differ. We also investigated whether public and private hospitals behave differently in terms of attracting patients. For this major cardio-surgical intervention, patient mobility in Italy is substantial (13.6% of total admissions). Such mobility mainly involves patients moving from southern to northern regions, which often requires several hundred kilometers of travel and a transfer of financial resources from poorer to richer regions. Patients admitted in the regions where they reside are older than those admitted outside their regions (69.2 versus 65.6, $p < 0.0001$), and stay in hospital approximately 0.7 days longer (14.7 versus 14.0, $p = 0.017$). Compared to public hospitals, private hospitals are more likely to admit non-resident patients (OR between 2.1 and 4.4). The extent and direction of patients' mobility raise equity concerns, as receiving care in locations that are distant from home requires substantial financial and relational resources.

1. Introduction

Since the adoption of EU Directive 24/2011[1] on patients' rights in cross-border healthcare, a major issue under discussion in many countries is the forecasted volume of cross-border flows under different scenarios, given administrative barriers and reimbursement rules. Case studies and partial descriptive statistics have provided important insights [1], but systematic analyses of patient flows across EU countries are still rare due to difficulty linking the information systems that exist in individual jurisdictions [2]. In the absence of cross-country European studies, the analysis of patient flows within countries may provide useful evidence. This study explores patient mobility in one large EU country. Italy has approximately 60 million people with extensive geographic, institutional and socio-economic diversity, and patient mobility has been guaranteed there since the inception of the National Health Service (NHS).

One of the fundamental healthcare rights of Italian citizens is the "freedom of choice of provider and place of care" [3,4]. In the early 1990s, the system was reformed to strengthen the role of individual regions and to introduce a quasi-market for health care provision [5–7]. In 1995, the

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[1] Directive 2011/24/EU of the European Parliament and of the Council of 9 March 2011 on the application of patients' rights in cross-border healthcare. Official Journal of the European Union, L 88:45–65 (http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:088:0045:0065:EN:PDF).

http://dx.doi.org/10.1016/j.healthpol.2014.03.002
0168-8510/

hospital financing reform introduced a Diagnosis Related Group (DRG)-based system for inpatient care [8]. The basic idea of the Italian quasi-market is that "money follows patients"; i.e. patients are free to choose any accredited provider in the country (public or private), within or outside the region of residence. Regions have to pay for the treatment provided to their residents by providers located in other regions and, in turn, they receive payments for health care provided to patients coming from other regions. The mobility concerns a wide spectrum of services ranging from hospital to specialist outpatient care and pharmaceuticals. In regards to inpatient and day hospital services, special agreements apply for interregional compensations. Since July 1st 2003, a so-called "uniform tariff" (TUC-tariffa unica convenzionata) applies to hospital treatments provided outside the region of residence. This tariff is DRG specific and is set at national level. At the end of each year, the TUC tariffs are used to calculate the net import–export balance for patients and thus determine the financial resources that must be transferred between regions.

Inter-regional mobility has been previously investigated in Spain and Italy. Both countries have a decentralized National Health Service and are characterized by significant regional socio-economic disparities. The Spanish study conducted in 2005 is based on aggregated panel data and shows that mobility is positively associated with per capita regional GDP and the overall supply of beds, suggesting that migration across Spanish regions is driven by quality concerns [9]. Similar results were previously obtained by Levaggi and Zanola in Italy [10]. In addition, three other Italian studies have investigated patient mobility across Local Health Authorities (LHAs). Lippi Bruni and colleagues analyzed referral patterns for patients receiving percutaneous transluminal coronary angioplasty (PTCA) in Emilia-Romagna [11]. Using inpatient admissions in 2001, Fabbri and Robone showed that patients tend to travel from poorer LHAs to richer ones, especially for cancer treatment [12]. Finally, the most recent Italian study investigated patient mobility stratified by disease severity in cardiac surgery units of three health areas in Tuscany [13].

With the exception of Tuscany study, none of the available studies analyzed inter-regional mobility with data at the patient level, and we are unaware of any studies that have investigated characteristics of migrating patients in comparison to those who obtain care in their regions of residency. Our study extends the current literature on patient mobility by providing novel evidence on two important issues. First, we investigate whether there are important differences in patient characteristics, hospital mortality and length of stay across migrating and non-migrating patients. Second, we compare public and private hospitals to explore whether these hospitals differ with regard to their popularity with non-resident patients.

2. Methodology

2.1. Dataset

We used a dataset provided by the Italian Department of Health that collates information on 11.657.864 hospital admissions and is the basis for monitoring hospital activities and funding inter-regional and international patient mobility. Admissions in 2009 were classified according to International Classification of Diseases-9-CM 2007 and version 24.0 of the DRG system.

In our study we focus on one specific healthcare procedure: the substitution of the aortic valve. This intervention, which occurs under life-threatening conditions and requires major heart surgery, is typically performed by specialized units. The choice of this procedure for our study was guided by two main reasons: (i) in Italy mobility for cardio-vascular diseases is significant and within major diagnostic category of cardiovascular diseases, this intervention represents approximately 20% of all admissions of non-resident patients and (ii) the procedure can be traced in our dataset with certainty. We excluded patients receiving Trans catheter Aortic Valve Implantation (Tavi) because this was still a rather new procedure in 2009 and was performed only in a few centers; we used only the admissions for which the substitution of the aortic valve was the first reported procedure in the discharge chart as the addition of admissions with other first procedures would have made the dataset much more heterogeneous and difficult to analyze.

The procedure was identified through ICD-9-CM procedure codes that included: 3520 (replacement of unspecified heart valve), 3521 (replacement of aortic valve with tissue graft) and 3522 (other replacement of aortic valve) [14,15]. For or each patient, the following information was available: age, gender, region of residence, DRG, discharge status, length of stay, type, location and ownership of the hospital. Public hospitals are those that are under the control of national or regional governments, whereas private hospitals are those run by commercial entities or non-profit institutions (in Italy, they are mainly linked to the Catholic Church).

2.2. Data analysis

Whether patients receive the treatment in the region in which they reside or travel to another region is the key variable under study. We use two basic indices to measure patient flows. For each region, the "*attraction rate*" is calculated as the ratio of the number of patients coming outside the region admitted to any regional hospital to the total number of admissions of that hospital. The "*escape rate*" is calculated as the ratio of the number of resident patients flown to other regions to the total number of residents of the region admitted to any Italian hospital. Both indices range from zero (no attraction and no escape) to 1 (i.e. "attraction rate" is 1 if the regional hospitals serve only patient residents in other regions, and "escape rate" is 1 if all resident patients are hospitalized in other regions). Unfortunately, we have no data on Italian residents admitted to hospitals in other countries. However, given the nature of the procedure, the number of such cases should be relatively small.

We compared the differences of means and proportions using two-tailed *t*-tests and chi-square tests at significance intervals of 5%. We used logit models and a multi-level logit models to identify factors associated with patient mobility. In all models the dependent variable was a binary outcome