

Determinants of inappropriate hospitalization in cataract surgery in the south of Italy: a retrospective study

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Abstract

Purpose To analyze the frequency of inappropriate hospitalization in cataract surgery and the type of related determinants.

Methods A nested retrospective case–control study was carried out on 2708 consecutive cataract surgery patients operated between January 2013 and December 2015. All cases with inappropriate hospitalization (day surgery or ordinary hospitalization) were compared with a control group of cases treated in an appropriate (day service) regimen. The predictive value for inappropriate admissions to the hospital was assessed using a logistic regression model. Significant variables from the univariate analysis were included in a multivariate model.

Results Forty-five cases (< 2%) of inappropriate hospital admissions were recorded. Residence, heart disease, tremors, anticoagulants, intraoperative floppy iris syndrome were not related to appropriateness, while psychotic disorder (OR 12.571, $p = 0.018$), anxiety-depressive syndrome (OR 7.818, $p = 0.010$)

and use of antipsychotropic drugs (OR 7.724, $p = 0.002$) were related to the inappropriateness of admission by univariate and multivariate analysis. Previous systemic surgeries were predictors of ordinary hospitalization by logistic regression analysis. A greater presence of hypertension, diabetes mellitus and fellow eye pseudophakia was noticed in appropriate hospitalization cases.

Conclusions This study detects the predictive role of psychiatric disorders as determinants of hospitalization inappropriateness in cataract surgery. The negative correlation between inappropriate hospitalization and conditions such as hypertension and diabetes points out that in the elderly population common diseases are effectively addressed, in contrast to the difficult management of psychiatric patients. Prior systemic interventions represent factors inducing transfer from day service to ordinary hospitalization, highlighting communication problems related to difficult coping with an outpatient surgery setting.

Keywords Surgical appropriateness · Hospitalization appropriateness · Cataract surgery · Comorbidities and hospital appropriateness

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Introduction

In the developed world, the rate and duration of ordinary hospitalizations (OH, defined as ≥ 1 day of

hospitalization) have been greatly reduced. Indeed, the advances in diagnostic, surgical and anesthesiological fields lead to a more frequent use of outpatient surgery, also described with various terms such as ambulatory surgery, same-day surgery, day case or day surgery. Furthermore, organizational models were set up to achieve an efficient management of resources and to improve the adequacy of patient access to surgery on the basis of appropriateness. This concept regards both clinical aspects and organizational issues in order to make the best possible use of the available health services and to reduce the potential negative consequences related to prolonged hospital stay [1, 2].

In Italy, a peculiar sub-type of outpatient ambulatory care exists, known as “day service” package (DS), which includes two to three admissions to an ambulatory service center inside or outside the hospital, allowing for the preoperative routine examination, the ambulatory surgery with immediate postoperative discharge (usually within 2 h) and the postoperative day examination. This differs from both the day surgery outpatient regimen (DH), which allows for hospital admission with postoperative care up to 23 h, and the inpatient one, or ordinary hospitalization (OH), which requires at least one overnight stay. Moreover, in our country, the term “appropriateness” became one of the criteria for the definition of essential levels of assistance with the National Health Plan 1998–2000 [3], causing a number of OH or DH hospital health-related activities to be currently performed on the DS sub-type ambulatory outpatient basis above described.

Cataract extraction represents the most common elective surgical procedure in the elderly. Outpatient surgery for cataract extraction is pretty advantageous from both the clinical and financial point of view, being more cost-effective and guaranteeing overlapping success rates and safety profiles as an overnight stay approach [4–16].

Ambulatory surgery became the standard of care for cataract surgery in western countries [17–20]. In Italy, the diagnosis-related group (DRG) 39—“Surgery of lens with or without vitrectomy”—is part of the 108 DRG list of procedures to be performed in DS regimen and at high risk of inappropriateness when performed both as an inpatient (OH) and an outpatient day surgery (DH) procedure. The term “risk of inappropriateness” implicitly indicates that some cataract surgery cases might be, in some selected

cases, appropriate in OH or DH regimen. For instance, a 2017 update from the Veneto region of the eligibility threshold values for OH and DH cataract procedures allows for only 1 and 2% of the total, respectively (Venetian Regional Council Resolution. n. 281 2017. Available: <https://bur.regione.veneto.it/BurvServices/pubblica/DettaglioDgr.aspx?id=341609>. 281. Allegato A. pdf. Accessed 28 August 2017).

Although it has been a long time since cataract surgery was included in DS procedures these thresholds have often been exceeded in many Italian regions [21, 22]. In fact, of 556,190 cataract procedures in 2014 in Italy, 19,362 (3.5%) were OH surgeries, 124,828 (22.4%) DH and 412,000 (74%) DS. Moreover, difficulty in management of complex surgical or clinical cases could justify the 6141 cases with a longer hospitalization [23].

The variability of these findings can be ascribed to the complex variability in factors making a health service appropriate [24, 25]. Different aspects related to patient conditions (socio-demographic profile, clinical severity, comorbidities, etc.), the supply system, incentives for professionals, degree of medical experience and adherence to guidelines cause the measure of the appropriateness to be challenging for clinicians, researchers, managers and policymakers [26, 27]. The identification of the factors explaining differences in utilization of services and health care is a priority to standardize the health offer to the citizens [28, 29]. This is of overwhelming importance in cataract surgery, ideal candidate for outpatient ambulatory care, but where social, surgical or anesthetic reasons seem to contribute to an inappropriate care regimen [30].

There is a paucity of studies, with a consequent lack of a reasonable threshold, about hospitalization inappropriateness for cataract surgery.

The purpose of this study is to point out and examine the variables that can be determinant of inappropriateness in order to avoid hospitalization, neither suitable nor safer for the patient.

We conducted a nested retrospective case–control study to analyze the frequency of inappropriateness of hospitalization in cataract surgery in first instance. As a secondary endpoint, we described which determinants could be related to this phenomenon, measuring the frequency of the indicators proposed by the appropriateness plane of the Ministry of Health in

Italy, with the aim of evaluating the degree of organizational appropriateness in cataract surgery.

Methods

Setting

The area of investigation includes the Western Sicily's Health District

The study was carried out at Ophthalmology Department, Palermo University, Italy. This department is the main referral center for a large geographic area (12,600 km²) of the Western Sicily's health district (with a population of approximately 1,950,000 inhabitants) where complex and complicated eye surgeries are treated. Approximately one thousand patients are admitted to this surgical unit each year for cataract surgery. Patient medical records are captured and stored in a medical record electronic database of the hospital.

Definition of appropriate and inappropriate admissions

As detailed in “Introduction”, day service package (DS) represents the appropriate care regimen for cataract surgery in Italy, while day hospital/surgery (DH) and ordinary hospitalization (OH) are considered at high risk of inappropriateness.

Design and patients

This was a nested retrospective case–control study on consecutive cataract patients with diagnosis of cataract who were admitted to the Ophthalmology Department of Palermo University, between January 2013 and December 2015. An informed consent for the collection and storage of personal and clinical data was obtained from all patients in accordance with the principles of the Declaration of Helsinki at the time of surgical intervention. The study protocol was approved by the Ethics Committee of the Azienda Ospedaliero-Universitaria Policlinico “Paolo Giaccone,” Palermo, Italy.

We reviewed the records from 2708 consecutive cataract surgery patients, which represent all the cases over the time period considered, and examined the

cases of inappropriate hospitalization, including day surgery and one or more days of ordinary hospitalization defined as DH and OH.

We compared all the surgical cataract patients with an inappropriate hospitalization (DH or OH) with a control group of surgical cataract cases treated in an appropriate outpatient regimen, i.e., DS; frequency match was performed randomly for age and sex (to correct for strong confounders), and year of surgery using a specific software (SPSS). We made this choice in order to guarantee uniformity and accuracy in data recording/analysis, taking into account putative confounding year-by-year differences in environmental/structural variables, which could have had a role in affecting the frequency of hospitalization in cataract surgery—thus influencing the comparison among data recorded in different years.

Anamnestic, laboratory data, demographic, clinical and therapeutic characteristics of patients were extracted from the medical record electronic database of the hospital. We decided to use MRR (medical review records) for the purpose of data collection from the electronic database of the hospital.

The data were extracted reliably and in an unbiased manner: We kept the data extractors blind to the study hypothesis and to the objective. We checked the reliability of the abstracted data in random samples. The following data were collected and entered into the specially designed database: (a) socio-demographic characteristics: age, gender, residence (urban, suburban—far > 15 km from the town limits—or rural, the latter two indicating residential areas possibly far from health facilities); (b) ocular clinical data such as cataract type, monocularly, eye (right or left); ocular comorbidities (glaucoma, cystoid macular edema, maculopathies, orbit, eyelids and lacrymal system abnormalities, corneal pathologies), past trauma history, previous ocular surgeries; (c) general clinical data such as lung and heart disease, hypercholesterolemia, diabetes, renal insufficiency, hypertension, benign prostatic hyperplasia, psychosis and anxiety-depressive syndrome, tremors, allergies, previous surgeries, pharmacological anamnesis; (d) surgical data as kind of anesthesia, type of hospitalization (DS or OH), intraoperative complications (intraoperative floppy iris syndrome [IFIS], etc.).

An intragroup analysis was performed comparing data obtained from DS patients with those collected from OH.

Statistical analysis

Statistical analysis of quantitative and qualitative data, including descriptive statistics, was performed for all items. Frequency match was selected to eliminate the effect of strong confounders (age, sex, year of surgery). Continuous data are expressed as mean \pm SD, unless otherwise specified. Baseline differences between groups were assessed by the Chi-square test or Fisher exact test, as needed for categorical variables, and by the univariate analysis of variance (ANOVA) for continuous variables. Logistic regression analysis examined the correlation between patient characteristics (independent variables), and type of inpatient/outpatient regimen (dependent variable) in simple and multiple regression model. Odds ratio (OR) and 95% confidence intervals (95% CIs) were calculated in both simple and multiple regression analyses.

Data were analyzed by IBM SPSS Software 22 version (IBM Corp., Armonk, NY, USA). All p values were two-sided, and $p < 0.05$ was considered statistically significant.

Results

Demographic and clinical characteristics of inappropriate (DS + OH) and appropriate (AS) regimens are shown in Table 1. In the study period, there were a total of 45 cases of inappropriate hospital admissions distributed without significant differences in the 3 years, including 19 females and 26 males with a mean age of 67.0 (12.5) years, with a rate of inappropriateness under 2% of all cataract surgery patients. There were 13, 14 and 18 inappropriate admissions, respectively, in 2013, 2014 and 2015 with no statistically significant differences in frequency ($p = 0.421$; Fisher's exact test). The analysis of variables in the group of patients with inappropriate hospitalization compared with the control group showed that some variables like residence, heart disease, tremors, anticoagulants and IFIS were not significantly related to appropriateness.

A higher frequency of psychosis, anxiety-depressive syndrome and an increased intake of antipsychotropic drugs were found in the former group, while in patients with appropriate outpatient (DS) regimen there was a significantly greater presence of

hypertension, diabetes mellitus and fellow eye pseudophakia (Table 1). All patients with appropriate outpatient regimen underwent local anesthesia, while of the 45 patients with inappropriate hospitalization, 14 were operated under local anesthesia with sedation, 26 general anesthesia and 5 local anesthesia.

In order to assess the predictive value for inappropriate admissions, all the variables considered in the study were analyzed using a logistic regression model. The significant variables originating from the univariate logistic regression analysis were included in a multivariate model (Tables 2, 3). Hypertension, diabetes mellitus, fellow eye pseudophakia were all negatively related to the inappropriateness of admission by univariate analysis, while positively related to the inappropriateness of admission are psychotic disorder, anxiety-depressive syndrome and the use of antipsychotropic drugs.

From the analysis of the significant variables in the multivariate model, we noted that the frequency of psychosis, anxiety-depressive syndromes and antipsychotropic drugs were predictors of inappropriateness of admission for cataract surgery (Table 3).

Of the 45 patients with inappropriate hospitalization, 9 were transferred from day service outpatient (DS) to day surgery or inpatient regimen (DH or OH), of which six patients had psychosis or anxiety-depressive syndrome, and five patients had previous systemic surgeries.

No cases of refusal of outpatient surgery, neither of DH/OH admission due to social isolation, were found in our medical review records.

No statistically significant differences emerged in the study by comparing the variables in patients with DH to those with OH regimen, except for the significantly higher frequency of previous systemic surgeries (especially hip intervention) ($p = 0.028$). Previous systemic surgeries were identified as a predictor of OH, by logistic regression analysis.

Discussion

As stated in "Introduction", in the last 20 years one of the most important changes in the organization of health care has been the development of day surgery, which has been accompanied by the ability to perform a high number of surgeries in ambulatory regimen, avoiding OH and producing significant benefits for

Table 1 Demographic and clinical characteristics of 45 cataract surgery cases with appropriate admission compared to 45 cases of inappropriate hospitalization between January 2013 and December 2015

	Inappropriate hospitalization	Appropriate hospitalization	<i>p</i> value
Residence urban/suburban ^a	31/14	33/12	0.82
Eye (Right/Left)	22/23	24/21	0.83
Monocularity (Yes)	2	0	0.49
Arterial hypertension	17	30	0.011
Heart disease	7	11	0.43
Diabetes mellitus	4	14	0.016
Respiratory distress	4	8	0.35
Benign prostatic hyperplasia	4	6	0.74
Psychosis	10	1	0.007
Anxiety disorder and depressive disorder	12	2	0.007
Tremors	2	1	1.0
Hypercholesterolemia	2	5	0.43
Other systemic diseases	14	15	1.0
Other systemic surgeries (other than ocular)	11	8	0.61
Antihypertensive drugs	17	24	0.20
Antiplatelet	6	13	0.12
Diuretics	9	14	0.33
Anticoagulants	3	1	0.62
Alpha-lytics	4	6	0.74
Antipsychotropic drugs	16	3	0.001
Antiepileptic	3	1	0.62
Allergies	10	13	0.63
Type of anesthesia			
Local	5	45	<0.0005
Local with sedation	14	0	
General	26	0	
Intraoperative floppy iris syndrome	3	3	1.0
Glaucoma	4	2	0.68
Cystoid macular edema	1	0	1.0
Maculopathies	2	3	1.0
Contralateral pseudophakia	13	23	0.031
Myopia	4	4	1.0
Corneal diseases	0	4	0.12
Adnexal disease	1	1	1.0
History of ocular trauma	1	0	1.0
Diseases of the posterior segment	5	2	0.434
Previous ocular surgery	2	1	1.0
Intraoperative complications	4	1	0.36
Hypotonic drugs	1	2	1.0
Antibiotics	1	0	1.0
Transfer from DS to DH/OH ^b	9	/	/

Statistically significant *p* values are highlighted in bold

^aResidential area possibly far from health facilities in Sicily

^bTransfer from DS: number of DS patients who passed to DH or OH

Table 2 Analysis of determinants of hospitalization inappropriateness in cataract surgery performed by univariate logistic regression analysis

	Odds ratio (OR)	95% CI OR	<i>p</i> value
Residence urban	0.805	0.323–2.008	0.64
Eye (right)	1.195	0.522–2.733	0.67
Arterial hypertension	0.304	0.128–0.721	0.007
Heart disease	0.569	0.198–1.635	0.29
Diabetes mellitus	0.216	0.065–0.721	0.013
Respiratory distress	0.451	0.125–1.623	0.22
Benign prostatic hyperplasia	0.634	0.166–2.419	0.50
Psychosis	12.571	1.535–102.970	0.018
Anxiety disorder and depressive disorder	7.818	1.636–37.360	0.010
Tremors	2.047	0.179–23.409	0.56
Hypercholesterolemia	0.372	0.068–2.027	0.25
Other systemic diseases	0.903	0.373–2.188	0.82
Other systemic surgeries (other than ocular)	1.496	0.538–4.161	0.44
Antihypertensive drugs	0.531	0.229–1.231	0.14
Antiplatelet	0.379	0.129–1.109	0.07
Diuretics	0.554	0.211–1.453	0.23
Anticoagulants	3.143	0.314–31.420	0.33
Alpha-lytics	0.634	0.166–2.419	0.50
Antipsychotropic drugs	7.724	2.062–28.938	0.002
Antiepileptic	3.143	0.314–31.420	0.33
Allergies	0.703	0.271–1.825	0.47
Intraoperative floppy iris syndrome	1.000	0.191–5.241	1.0
Glaucoma	2.098	0.364–12.076	0.41
Maculopathies	0.651	0.104–4.096	0.65
Myopia	1.000	0.234–4.271	1.0
Adnexal disease	1.000	0.061–16.496	1.0
Diseases of the posterior segment	2.687	0.493–14.644	0.25
Previous ocular surgery	2.047	0.179–23.409	0.56
Intraoperative complications	4.293	0.461–40.010	0.20
Hypotonic drugs	0.489	0.043–5.589	0.56
Contralateral pseudophakia	0.389	0.163–0.928	0.033

Statistically significant *p* values are highlighted in bold

Table 3 Analysis of determinants of hospitalization inappropriateness in cataract surgery performed by multivariate logistic regression analysis

	Odds ratio (OR)	95% CI OR	<i>p</i> value
Arterial hypertension	0.378	0.135–1.054	0.06
Diabetes mellitus	0.353	0.074–1.687	0.19
Psychosis	18.078	2.020–161.827	0.010
Antipsychotropic drugs	18.6	3.037–113.744	0.002
Anxiety disorder and depressive disorder	10.058	1.887–53.605	0.007
Contralateral pseudophakia	0.380	0.124–1.165	0.09

Statistically significant *p* values are highlighted in bold

patients (promptness, less risk of infection, lower risk of postponement and delays, more peaceful and rapid return home) and for the system (considerable reduction in healthcare costs). The “ambulatory/day surgery” debate is still calling attention at international level [31, 32], leading to increase in number of countries to the creation of accurate and specific guidelines. The creation of such a code of protocols produced financial consequences depending on the more affordable costs of ambulatory procedures in comparison with hospital ones [33–37].

The evaluation of appropriate hospitalization is another critical point to which attention must be paid in the scenario of outpatient vs inpatient surgical procedure decision.

In recent years even in Italy, there have been growing interest and sensitivity of the institutions about the crucial importance of studying the appropriateness of benefits provided by the National Health Service (SSN), particularly as regards the search for indicators helpful in measuring the quality of performance and the use of healthcare resources. Currently, a great importance is given to the concept of appropriateness in terms of both clinical effectiveness and organizational adequacy (i.e., preventable hospitalization) [38].

In this context, appropriateness is seen as a guiding principle in integrated hospital and community services, necessary to ensure both continuity of care and an optimal use of healthcare resources [39]. One reference text in this field is the NHS Atlas of Variation in Healthcare [40] representing a tool developed in order to facilitate the understanding of this issue.

The concept of ophthalmic ambulatory surgery was elaborated nearly 100 years ago, making day-case cataract surgery the standard procedure worldwide in the early 1990s [7–11, 41, 42].

In Italy, differences in regulations and costs at local level hampered the uniform development of this concept starting from the early 1980s.

An improvement was achieved in 2011, with an official Italian document concerning the “Definition of Essential Levels of Assistance” [43]; in this document, 43 DRGs were identified as at high risk of inappropriateness if used for inpatient intervention. The depicted frame of the Italian National Health System revealed a strong regional effect, with a wide local variability involving both the efficiency of the

healthcare system and socio-demographic conditions, producing a variegated distribution of inappropriateness for DRG selected as indicators. In particular, in 2002 for “cataract surgery” the admissibility threshold value for inpatient/outpatient was estimated as 46% [43]. Given that ambulatory surgery is generally considered as the most convenient approach for the majority of cases, this threshold, decreasing year by year, can be regarded as a “proxy” indicator of appropriateness.

Despite the fact that the sample size must be extended to extrapolate definitive conclusions, in our study the predictive role of psychotic disorders in relation to appropriateness emerged. It is interesting to note the negative correlation between inappropriateness and other systemic diseases and medical conditions such as hypertension, diabetes and presence of contralateral pseudophakia, probably pointing out the fact that more attention is given to some very common conditions in the elderly population (such as cardiovascular diseases and diabetes). Instead, it is more difficult to evaluate and effectively manage patients with psychiatric disorders. Our study also revealed that prior systemic interventions in the patient are a predictive condition to induce a transfer from DS to DH/OH, probably highlighting a deficiency in the communication level with the patient, who has difficulty in coping with cataract surgery in an outpatient setting.

Limitations consist in the retrospective design evaluating the data collected in the patient’s medical record. Again we must emphasize that it is not always possible to trace the context in which clinical decisions were taken; e.g., in some cases, social conditions or isolation of the patient is able to justify the prolongation of hospital stay and/or the use of more intensive assistance levels.

We must anyway note that a wide family network and assistance to the elderly is still very common in the south of Italy, making social isolation, and therefore the above occurrence rare.

Our results differ from those by Suarez and coworkers [30], who highlighted the role of social, surgical or anesthetic reasons as determinants, with a higher percentage, for inpatients hospitalization in cataract surgery. Actually, the latter differs from our study under many respects, such as different socioeconomic conditions, healthcare legislation, inclusion of cases of cataract surgery combined with other

procedures (vitrectomy, antiglaucoma surgery, keratoplasty). The two studies agree in correlating the highest frequency of sedation or general anesthesia in the inpatient group, even if due to different reasons, related to the clinical and haematological status of patients in the French study, while closely related to the mental and emotional status in our patients. Again the above-said differences in reality on the ground and study design could justify this finding.

Under current healthcare legislation, since 2011 a threshold value of inpatient admissions is identified, corresponding to 5% DS for cataract surgery; beyond these limits, financial penalties are envisaged.

As given in “Introduction” section, in some regions leader in health care, like Veneto, this threshold has been recently lowered to a mere 2%.

In our center (a major referral center for cataract surgery especially for very old patients with systemic comorbidities), the rate of inappropriateness does not exceed 2%. This is certainly a good result despite being desirable that even patients with complex diseases (as in the case of psychiatric disorders or stress situations linked to prior surgical treatments) may be assigned to a preventive hospitalization or to be entrusted to custom triage, avoiding the trauma of the transformation of the type of hospitalization during the surgical procedure.

Considering the balance involving success rate, safety profile and cost-effectiveness, performing cataract surgery as a DS procedure appears to be fully acceptable. The introduction of registers and specific high-quality clinical databases collecting evidences in support and against DS procedure will have the power to improve the access and management of resources and to reach a global agreement about clinical and social recommendations for inpatient care, selecting DS only if the established criteria are met.

Compliance with ethical standards

Conflict of interest The authors declare that there is no conflict of interest.

References

1. Franco G (2004) Health policy and occupational health: tools and methods to assure quality and appropriateness of interventions. *Med Lav* 95:3–10
2. The Royal College of Surgeons of England (1992) Guidelines for day case surgery. London: RCEng - Professional Standards and Regulation
3. Legislative Decree 229/99. <http://www.parlamento.it/parlam/leggi/deleghe/99229dl.htm>. Accessed 20 February 2017
4. Woodcock M, Shah S, Smith RJ (2004) Recent advances in customising cataract surgery. *BMJ* 328:92–96
5. Crabtree HL, Hildreth AJ, O’Connell JE et al (1999) Measuring visual symptoms in British cataract patients: the cataract symptom scale. *Br J Ophthalmol* 83:519–523
6. Fedorowicz Z, Lawrence D, Gutierrez P (2005) Day care versus in-patient surgery for age-related cataract. *Cochrane Database Syst Rev* 1:CD004242
7. Fedorowicz Z, Lawrence D, Gutierrez P et al (2011) Day care versus in-patient surgery for age-related cataract. *Cochrane Database Syst Rev* 7:CD004242
8. Lawrence D, Fedorowicz Z, van Zuuven EJ (2015) Day care versus in-patient surgery for age-related cataract. *Cochrane Database Syst Rev* 11:CD004242
9. Atalla ML, Wells KK, Peucker N et al (2000) Cataract extraction in a major ophthalmic hospital: day-case or overnight stay? *Clin Experiment Ophthalmol* 28:83–88
10. Cooper JM (1996) Development of day-case cataract surgery: a literature review. *Br J Nurs* 5:1327–1333
11. Cooper JM (1997) Day-case cataract surgery in the UK and USA: a comparative study. *Br J Nurs* 6:39–43
12. McCarty CA (2002) Cataract in the 21st Century: lessons from previous epidemiological research. *Clin Exp Optom* 85:91–96
13. Richter-Mueksch S, Zehetmayer M, Radner W et al (2001) Influence of sex, visual acuity, and systemic disease on delayed presentation for cataract surgery in Austria. *J Cataract Refract Surg* 27:1999–2005
14. Wong TY (2001) Effect of increasing age on cataract surgery outcomes in very elderly patients. *BMJ* 322:1104–1106
15. Conner-Spady BL, Sanmugasunderam S, Courtright P et al (2005) Patient and physician perspectives of maximum acceptable waiting times for cataract surgery. *Can J Ophthalmol* 40:439–447
16. Lundstrom M, Albrecht S, Nilsson M et al (2006) Benefit to patients of bilateral same-day cataract extraction: randomized clinical study. *J Cataract Refract Surg* 32:826–830
17. Mavrikakis I, Georgiou T, Paul B et al (2006) Cataract surgery by appointment—a pilot study. *BMC Ophthalmol* 6:18
18. Mojon-Azzi SM, Mojon DS (2007) The rate of outpatient cataract surgery in ten European countries: an analysis using data from the SHARE survey. *Graefes Arch Clin Exp Ophthalmol* 245:1041–1044
19. Barbieri V, Schmid E, Ulmer H et al (2007) Health care supply for cataract in Austrian public and private hospitals. *Eur J Ophthalmol* 17:557–564
20. Weingessel B, Richter-Mueksch S, Weingessel A et al (2008) Is day-case cataract surgery an attractive alternative from the patients’ point of view? A questionnaire survey. *Wien Klin Wochenschr* 120:756–760
21. Pact Health of 3/12/2009. <http://www.trovanorme.salute.gov.it/norme/dettaglioAtto?id=31789&completo=true>. Accessed 20 February 2017

22. Cillino S, Casuccio A, Di Pace F et al (2007) Day care cataract surgery in Central and Southern Italy: a multicentric survey. *BMC Health Serv Res* 7:16
23. Italian Ophthalmological Society (Società Oftalmologica Italiana - SOI) - Clinical and Organizational Guidelines on Surgery Of Cataract –SOI edition, November 2014. <http://www.quotidianosanita.it/allegati/allegato1684845.pdf> Accessed 20 February 2017
24. Lavis JN, Anderson GM (1996) Appropriateness in health care delivery: definitions, measurement and policy implications. *CMAJ* 154:321–328
25. Appleby J, Raleigh V, Frosini F, Bevan G, Gao H, Lyscom T (2011) Variations in health care. The King's Fund. Website: <http://www.kingsfund.org.uk/sites/files/kf/Variations-in-health-care-good-bad-inexplicable-report-The-Kings-Fund-April-2011.pdf>. Last accessed 25 October 2016
26. Noest S, Ludt S, Klingenberg A, Glassen K, Heiss F, Ose D, Rochon J, Bozorgmehr K, Wensing M, Szecsenyi J (2014) Involving patients in detecting quality gaps in a fragmented healthcare system: development of a questionnaire for Patients' Experiences Across Health Care Sectors (PEACS). *Int J Qual Health Care* 26:240–249
27. Southern DA, Hall M, White DE, Romano PS, Sundararajan V, Droessler SE, Pincus HA, Ghali WA (2016) Opportunities and challenges for quality and safety applications in ICD-11: an international survey of users of coded health data. *Int J Qual Health Care* 28:129–135
28. Rumball-Smith J, Sarfati D, Hider P, Blakely T (2013) Ethnic disparities in the quality of hospital care in New Zealand, as measured by 30-day rate of unplanned readmission/death. *Int J Qual Health Care* 25:248–254
29. Moraros J, Lemstra M, Nwankwo C (2016) Lean interventions in healthcare: do they actually work? A systematic literature review. *Int J Qual Health Care* 28:150–165
30. Suarez C, Tolou C, Cassagne M et al (2013) Quels obstacles au développement de la chirurgie ambulatoire de la cataracte au CHU de Toulouse en 2013? *J Fr d'Ophthalmol* 38:822–831
31. International Association for Ambulatory Surgery (2001) Council of Presidents Foundation and early history of the international association for ambulatory surgery 1995–2001. *Ambul Surg* 9:125–126. [https://doi.org/10.1016/S0966-6532\(01\)00113-5](https://doi.org/10.1016/S0966-6532(01)00113-5)
32. De Lathouwer C, Poullier JP (2000) How much ambulatory surgery in the World in 1996–1997 and trends? *Ambul Surg* 8:191–210. [https://doi.org/10.1016/S0966-6532\(00\)00065-2](https://doi.org/10.1016/S0966-6532(00)00065-2)
33. Castells X, Alonso J, Castilla M et al (2001) Outcomes and costs of outpatient and inpatient cataract surgery: a randomised clinical trial. *J Clin Epidemiol* 54:23–29. [https://doi.org/10.1016/S0895-4356\(00\)00271-7](https://doi.org/10.1016/S0895-4356(00)00271-7)
34. Guzzanti E, Mastrobuono I (1999) Organisational, technological and structural standards for office based ambulatory surgery and day surgery. *Ambul Surg* 7:159–165. [https://doi.org/10.1016/S0966-6532\(99\)00011-6](https://doi.org/10.1016/S0966-6532(99)00011-6)
35. Kroneman MW, Westert GP, Groenewegen PP et al (2001) International variations in the availability and diffusion of alternatives to in-patient care in Europe: the case of day surgery. *Ambul Surg* 9:147–154. [https://doi.org/10.1016/S0966-6532\(01\)00120-2](https://doi.org/10.1016/S0966-6532(01)00120-2)
36. Nghiem-Bufferet MH, de Pouvourville G, Renard G et al (2001) Cost of managing cataracts. Evaluation of traditional hospitalization and ambulatory surgery. *Presse Med* 30:1924–1926
37. Ogg T (1998) Office-based surgery: How should the International Association for ambulatory surgery proceed? *Ambul Surg* 6:187–188. [https://doi.org/10.1016/S0966-6532\(98\)00004-3](https://doi.org/10.1016/S0966-6532(98)00004-3)
38. Finance Act 2006-Law n. 266, 23/12/2005, Rules for drawing up of the annual and multiannual budget of the State. http://www.mef.gov.it/depositi-dormienti/documenti/L_23-12-2005_n_266.pdf. Accessed 20 February 2017
39. Health Ministry (2011) Appropriateness Project - Research and experimentation of indicators to determine the degree of appropriateness of the services of hospitalization caused by deficiencies of other forms of assistance. http://www.salute.gov.it/imgs/C_17_pubblicazioni_1492_allegato.pdf. Accessed 20 February 2017
40. NHS Atlas of Variation in Healthcare (2011). <http://www.eastsussexjsna.org.uk/JsnaSiteAspx/media/jsna-media/documents/nationalprofiles/profileassests/Atlas%20of%20Variation/2011AtlasNov2011.pdf> Accessed 20 February 2017
41. Bailey FW (1928) Cataract operations performed on patients in their own beds. *J Iowa Med Soc* 18:8–10
42. Ingram RM, Banerjee D, Traynar MJ et al (1983) Day-case cataract surgery. *Br J Ophthalmol* 67:278–281
43. Decree President Council of Ministers 29 November 2001. Definition of the Essential Levels of Assistance. Ministry of Health Hospital discharge appropriateness in Italy with APPRO methodology Roma 2002