First hip arthroplasty register in Italy: 55,000 cases and 7 year follow-up

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Abstract The Register for Orthopaedic Prosthetic Implantation (RIPO) has been prospectively collecting data on hip prostheses performed in all the orthopaedic units in the region Emilia-Romagna since January 2000. The register aims to determine the characteristics of patients, evaluate the effectiveness of prostheses, and allow internal audit. Adherence to the register is compulsory (93% capture). By 31 December 2006 the register contained data on 35,041 primary total hip arthroplasty (THA), 14,613 hemiarthroplasties, and 5,878 revisions. All prosthetic components are registered on an individual basis. Survival analysis is done following the Kaplan Meier method. Cumulative survival rate at 7 years is 96.8% (95% CI: 96.4–97.1%) for THA and 97.6% (97.0–98.3%) for hemiarthroplasties. Multivariate analysis verified that survival of the THA is affected by pathology, where the worst conditions are rheumatoid arthritis, femoral neck fracture, and sequelae of coxitis or Paget's disease. Results are comparable to other major registers of Northern Europe and Australia.

Résumé Le Registre de Prothèses Orthopédiques (RIPO) a récupéré, progressivement les données des prothèses de hanches, réalisées dans des services d'orthopédie de la

région Emilie – Romagne depuis le 1er janvier 2000. Le but de ce registre est de déterminer les caractéristiques des patients et d'évaluer les bénéfices des prothèses et permettre un audit interne. L'adhésion à ce registre n'est pas obligatoire mais volontaire, 93% d'adhésions. Au 31 décembre 2006, ce registre comprenait 35.041 prothèses totales de hanche primaires, 14.613 hémiarthroplasties et 5.878 révisions. Les courbes de survie ont été réalisées selon la méthode de Kaplan Meier. La courbe de survie cumulative à 7 ans était 96,8% (95% intervalle de confiance: 96.4–97.1%) pour les prothèses totales, 97.6% (97.0–98.3%) pour les hémiarthroplasties. Les courbes de survie sont affectées par la pathologie des patients. Les conditions les plus défavorables sont l'arthrite rhumatoïde, les fractures du col, les séquelles de coxite ou de maladie de Paget. En conclusion, les résultats de ce registre sont comparables aux autres registres du Nord de l'Europe et de l'Australie.

Introduction

On the basis of the benefits obtained by the Scandinavian arthroplasty registers, a local register was set up in the Emilia-Romagna region, in the north of Italy [6–8, 10–13]. It was initiated on January 1, 2000 as the first regional register in Italy and collects data on primary total hip replacements, hemiarthroplasties, and revisions, performed both in public and in private hospitals. All previous attempts to establish voluntary registers had failed due to very low compliance of surgeons. Thus, local health authorities decided to force the adherence by linking the reimbursement of the Diagnosis Related Groups (DRG) to participation in the register or by defining it as an objective for general directors of the hospitals.

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Emilia-Romagna is 22,000 km² wide, with approximately 4.5 million inhabitants (of whom 23% are over 65 years old) and it has 68 orthopaedic units, either public hospitals or private clinics, where hip replacements are performed. Emilia-Romagna has 7% of the Italian population and performs 11.4% of primary THA and 14.6% of revisions for the entire country. The hip register was first set up and validated over a 10-year period beginning in 1990 at the Istituto Ortopedico Rizzoli, which is a monospecialistic hospital [15]. It was called the Register of Orthopaedic Prosthetic Implants (RIPO) and it aimed to improve patients' health during and after total hip replacement by giving surgeons evidence of the best performing implants and techniques so as to ensure that healthcare resources are correctly used.

Methods

Data recording is done for each operation by the surgical staff. A form is completed with identification of the patient, information about diagnosis or reason for reoperation, affected side, Charnley hip score, weight and height, surgical approach, antibiotic and antithromboembolic prophylaxis, blood transfusions, use of bone grafts, and perioperative complications. Cup, stem, head, and liners are separately registered, using stickers with catalogue numbers and batches provided by the manufacturers. Fixation of the components, brand of cement, and technique of preparation and application in the stem are registered. Forms are transmitted to RIPO. Missing or incongruent data, if any, are requested by register staff from the reference surgeon of the respective unit before data entry into a database set in CINECA (Consorzio Inter-universitario di Calcolo per l'Italia del Nord-Est). Quality of data is regularly checked through the analysis of data distribution and through random control on 10% of entered forms. Input errors are also monitored by means of an autorunning quality control check-up.

Revision of at least one component is used as an end-point in all the analyses. The lifetime of the primary prosthesis ends at the time of prosthesis removal. The lifetime of a revision prosthesis starts from the date of implant. Two-stage revision (Girdlestone) is considered a failure for the first prosthesis at the time of prosthesis removal.

Implant survivorship is estimated with the use of the Cox proportional hazard model [3] and the Kaplan Meier method [2]. Ninety-five percent confidence intervals are calculated.

Validity and efficacy of reporting from the units are guaranteed by merging RIPO and the regional register of hospital discharge. Deaths are obtained from merging RIPO data with the national database.

Results

Adhesion rate to RIPO reached 92.6% of all operations. The number of operations recorded by RIPO in the period January 2000 through December 2006 was 35,041 THA, 14,613 hemiarthroplasties, and 5,878 revisions.

Women comprised 66.4% of patients and more than 54.0% were overweight with a body mass index higher than 25. Mean age at primary surgery was 66.9 years (range, 16–101 years), at revision 70.0 years (22–98), and at hemiarthroplasty 83.0 years (23–109).

The diagnoses for primary surgery and reasons for revision are illustrated in Table 1. The group denoted 'other diagnosis' in primary surgery includes the osteonecrosis of femoral head due to steroids or dialysis, nonunion in femoral neck fractures, and Paget's diseases, among a few others. In the group denoted 'other reasons for revisions', conversion from hemiarthroplasty into total arthroplasty is primarily included. Among revisions,

Table 1 Diagnosis for primary total hip replacement and reasons for revision

Aetiology	n	%
Primary total hip replacement		
Coxarthrosis	23,245	66.5
Sequelae of congenital dysplasia, epiphysiolysis, and Perthes' disease	4,265	12.2
Idiopathic femoral head necrosis	1,927	5.5
Femoral fracture	3,036	8.7
Post-traumatic arthritis	824	2.4
Post-traumatic femoral head necrosis	496	1.4
Rheumatoid arthritis	449	1.3
Others	699	2.0
Total ^a	34,941	100.0
Reason for revision		
<i>Arthroplasties</i>		
Aseptic loosening of both components	1570	27.1
Loosening of the cup	1839	31.7
Loosening of the stem	625	10.8
Deep infection	92	1.6
Dislocation	422	7.3
Prosthesis damage	129	2.2
Two-step revision	197	3.4
Pain without loosening	66	1.1
Bone fracture	194	3.3
Others	262	4.4
<i>Hemiarthroplasties</i>		
Loosening of the stem	158	2.7
Cotyloiditis	117	2.0
Dislocation	137	2.4
Total	5,808 ^b	100.0

^a 100 points of data are missing

^b 70 points of data are missing

33.9% were total revision, 41.2% were cup revisions, and the remaining were either stem or head revisions.

Hemiarthroplasty was the primary treatment for femoral fracture in 97.7% of the patients.

The proportion of uncemented, cemented, and hybrid primary replacements and revision operations is summarised in Table 2; in Table 3 articular couplings are shown. In both tables, revisions of single components are not included. Hemiarthroplasty stems were cemented in 91.0% of cases.

The ‘top five’ cups implanted in primary surgery in the period 2000–2006 were Anca-fit Wright Cremascoli (18.7%), CLS Sulzer Centerpulse Zimmer (8.2%), Fixa Adler (7.8%), ABGII Stryker Howmedica (4.8%), and Duofit PSF Samo (3.8%); these cups represent only 43.4% of all implants.

Among stems, Anca-fit Wright Cremascoli (12.1%), Conus Sulzer Centerpulse Zimmer (8.2%), Apta Adler (5.9%), CLS Sulzer Centerpulse Zimmer (5.9%), and ABGII Stryker Howmedica (5.5%) were the most popular stems, even if they represented only 37.6% of all implants.

Ninety-eight different types of stems and 87 different types of cups were implanted in Emilia-Romagna in 2006. The situation was similar for total revision where 55 different types of stems or cups were used.

Heparin was used for antithromboembolic prophylaxis in the nearly all patients. Antibiotic prophylaxis was accomplished by many different drugs, the most frequently used in primary surgery was cefazoline (30%) and cefazoline combined with either tobramycin, netilmicin, or gentamicin (23.7%). A multiple dosage was preferred to a single shot in 81% of operations.

A lateral approach was used in 65.4% of primary total arthroplasty and 55.0% of hemiarthroplasties. Intraoperative complications included bone fractures and anaesthetic complications. Local postop complications included deep venous thrombosis, haematoma, peripheral nerve lesions,

Table 2 Type of fixation of total hip prosthesis—either primary or revision

Fixation	Primary total hip arthroplasty		Total revision	
	<i>n</i>	%	<i>n</i>	%
Uncemented	25,702	73.6	1,329	66.9
Hybrid (uncemented cup, cemented stem)	5,290	15.1	172	8.7
Cemented	3,658	10.5	154	7.7
Reverse hybrid (cemented cup, uncemented stem)	286	0.8	332	16.7
Total ^a	34,936	100.0	1,987	100.0

^a 105 points of data are missing in primary surgery and 6 in revision

Table 3 Articular coupling of total hip prostheses—either primary or revision

Articular coupling	Primary total hip arthroplasty		Total revision	
	<i>n</i>	%	<i>n</i>	%
Metal on polyethylene	12,999	37.3	875	44.3
Ceramic on ceramic	9,497	27.2	333	16.8
Ceramic on polyethylene	9,340	26.8	703	35.5
Metal on metal	3,022	8.7	68	3.4
Total ^a	34,858	100.0	1,979	100.0

^a 183 points of data are missing in primary surgery and 14 in revision

prosthesis dislocation and infection. General postop complications included embolism, heart attack, minor gastrointestinal or urinary problems (Fig. 1).

The duration of hospital stay was also recorded and elaborated so as to provide an index of improvement in the hospital programme. In 2000, mean presurgery hospital stay was 2.4 days (95% CI: 2.3–2.5%) for primary hip arthroplasty and 3.5 days (95% CI: 3.3–3.6%) for hemiarthroplasty. In 2006 mean presurgery hospital stay was 1.8 (95% CI: 1.8–1.9%) and 3.9 days (CI 95%: 3.7–4.0%) for primary hip arthroplasty and hemiarthroplasty, respectively.

The difference observed in the average presurgery stay in THA between 2000 and 2006 is statistically significant (*t* test for equality of mean $p < 0.001$).

The survival curve of THA is shown in Table 2. Mean value at 7 years is 96.8% (95% CI: 96.4–97.1%).

Of the 35,041 primary implants, 670 revisions were performed. Reasons for revision are detailed in Fig. 2.

The survival curve of hemiarthroplasties is shown in Fig. 3. Mean value at 7 years is 97.6% (95% CI: 97.0–98.3%); 190 revisions were performed on 14,613 hemiarthroplasties. Reasons for revision are also presented in Fig. 3; it should be stressed that only surgically treated dislocations were considered.

The survival curve was also plotted for total revision (Table 4). In this case the end point is represented by

Table 4 Complications occurring during hospitalisation

Complications	Primary surgery (35,041)		Hemiarthroplasty (14,613)		Revision (5,878)	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Intrasurgery	438	1.2	154	1.0	173	2.9
Local postsurgery	907	2.6	317	2.2	235	4.0
General postsurgery	1,996	5.7	1,315	9.0	394	6.7
Death	97	0.3	580	4.0	37	0.6

Fig. 1 Survival of total hip arthroplasties (diagnosis and reason for revision)

n. total hip arthroplasties	n. of failures
35.041	670

Reasons for revision	Rate	Percentage	% distribution of cause of failure
Dislocation	202/35041	0.6	30.2
Aseptic loosening of stem	115/35041	0.3	17.2
Aseptic loosening of cup	100/35041	0.28	14.9
Total aseptic loosening	44/35041	0.13	6.6
Periprosthetic bone fracture	65/35041	0.19	9.7
Septic loosening	44/35041	0.13	6.6
Prosthesis fracture	39/35041	0.11	5.8
Pain without loosening	14/35041	0.04	2.1
Primary instability	21/35041	0.06	3.1
Other	18/35041	0.05	2.7
Missing	8/35041	0.02	1.2
Total	670/35041	1.9	100.0

second revisions of at least one component. On the 1993 total revision, 118 second revisions were performed, thus giving a survival mean value at 6 years of 91.8% (95% CI: 90.2–93.4%).

Multivariate analysis was applied to test the influence of single factors on the survival of the THA.

The end point was revision of stem and/or cup. Variables included gender, age, diagnosis, and volume of operations performed in the surgical unit (more or less than 50 per year). The Cox multivariate test enabled verification of the influence of one variable on the others.

The chi-square test was used to globally test if the model was significant, i.e. if the variables put into the model influenced significantly the outcome of prosthetic surgery (chi-square=45.5).

A relative risk rate below one indicated a reduced risk of prosthesis loosening.

The outcome of THA was not significantly affected by gender, age, and volume of operations, but was negatively affected by diagnosis. The worst conditions occur in patients affected by rheumatoid arthritis (relative risk rate 1.80; 95% CI: 1.05–3.07), femoral neck fracture and sequelae (relative risk rate 1.70; 95% CI: 1.40–2.11), and sequelae of coxitis or Paget's disease (relative risk rate 2.54; 95% CI: 1.35–4.78).

Discussion

The results of the first successful effort to set up a regional register in Italy based on the same principles of the registers of Sweden, Norway, Finland, Denmark, and Australia are presented here [5–7, 9]. To reach this goal the linkage of the reimbursement of the Diagnosis

Fig. 2 Survival of hemiarthroplasties (diagnoses and reasons for revision)

n. of hemiarthroplasties	n. of failures
14.613	190

Reasons for revision	Rate	Percentage	% distribution of cause of failure
Dislocation	99/14613	0.7	52.1
Aseptic loosening of stem	29/14613	0.2	15.3
Cotyloditis	29/14613	0.2	15.3
Periprosthetic bone fracture	13/14613	0.1	6.8
Septic loosening	13/14613	0.1	6.8
Missing	2/14613	0.01	1.1
Other	5/14613	0.03	2.6
Total	190/14613	1.3	100.0

Related Groups (DRG) has been crucial for setting up the register, as all previous efforts to create a register on a voluntary basis rapidly failed due to the low compliance rate of many surgeons.

The population of the region Emilia-Romagna is comparable to the population of Norway (4.5 million), lower than both Finland (5.2) and Denmark (5.4), and about half of Sweden (9.0). The age distribution is similar: 19.2% are over 65 in Italy (22.7% in Emilia-Romagna), 17.2% in Sweden, 14.9% in Denmark, and 15.5% in Finland. Mean age at primary surgery is 66.9 years for total hip arthroplasty and 83.1 for hemiarthroplasty. Mean age for total hip arthroplasty is 68 years in Sweden, 70 in Norway, 68 in Denmark, and 66 in Finland. No other register collects data on hemiarthroplasty, so comparison is not possible.

The mean age at primary surgery in Emilia-Romagna is lower than in Scandinavian registers which is possibly due to the higher rate of operations performed to treat sequelae of congenital diseases such as hip dysplasia (12.2% in

Emilia-Romagna vs 8.2% in Norway, 2.5% in Denmark, and 1.7% in Sweden). The reason for this is probably the higher rate of disease in the region compared to the rest of Italy (8/1000 vs 1/1000 in Italy), and because the Rizzoli Institute is highly specialised in this field and receives cases from all over the country.

Another possible reason to justify the difference of mean age at time of surgery might be in the choice of treatment of femoral neck fractures in the elderly by total hip arthroplasty in the Scandinavian countries. The incidence of femoral neck fracture is similar (1,200/100,000 inhabitants in Scandinavia vs 1,110/100,000 inhabitants in Italy) [14]; nevertheless, in Italy 9.4% of cumulative THA are performed on primary femoral fractures, with values of 10.9% in Sweden, further rising to 13.0% in Norway and 12.8% in Denmark. This might partially explain the difference.

The rate of primary arthroplasty in Emilia-Romagna is 99 per 100,000 inhabitants, which is lower than in Sweden and Norway (120) but higher than in Finland (82). It should

Fig. 3 Survival of total revision. The end point is represented by second revisions of at least one component

n. of total revision	n. of second revisions
1.993	118

Reasons for revision	Rate	Percentage	% distribution of cause of failure
Dislocation	33/1993	1.7	28.0
Aseptic loosening of cup	26/1993	1.3	22.0
Aseptic loosening of stem	19/1993	1.0	16.1
Septic loosening	12/1993	0.6	10.2
Total aseptic loosening	11/1993	0.6	9.3
Periprosthetic bone fracture	9/1993	0.5	7.6
Prosthesis fracture	1/1993	0.1	0.8
Pain without loosening	1/1993	0.1	0.8
Primary instability	1/1993	0.1	0.8
Other	2/1993	0.1	1.7
Missing	3/1993	0.2	2.5
Total	118/1993	1.9	100.0

be noted that the rate is only apparently higher in Emilia-Romagna (5,082 THA per 4 million gives a rate of 127), because 1,140 of THA were performed on extra-region patients.

The male/female ratio in the registers is 37.8:62.2 in Italy, 41:59 in Denmark, 40:60 in Sweden, and 31:69 in Norway.

Unlike the Swedish and Danish registers, but similar to that of Norway, a large number of different prosthetic brands are used. The phenomenon does not seem to diminish; on the contrary, it is worsening. The risk is that the learning curve has to be reapplied on each type of prostheses and that statistical analysis to prove the efficacy of a model must be delayed in order

to obtain numerically significant samples. It should be also pointed out that in 20% of primary operations, components from different companies are assembled in a single implant, thus creating possible future medico-legal problems even if virtually no problems arise for survival curves as any component is separately traced.

With regard to the fixation of the prosthesis, it is interesting to note that the number of uncemented prostheses is particularly high in our register, nearly double that of the Swedish register for the same period but similar to that of the Norwegian register. This anomaly enables interesting comparisons with other major databases. The high percentage of total hip replacements with ceramic on ceramic (cer) coupling is especially interesting because no other register

has the same experience. During our 7 years experience, metal (met) on polyethylene (pol) couplings are progressively decreasing from 45.6 to 29.6%, whilst met-met and cer-cer are increasing.

In total revision surgery cer-pol coupling increased from 34.5% in 2000 to 22.0% in 2006.

The duration of hospital stay is not reported in other registers, so comparison is not possible.

Survival rate at 7 years is 97.6% for hemiarthoplasties and 96.8% for primary total hip prostheses, the latter value being comparable to the Swedish (94.0%), the Danish (94.5%), and the Norwegian values (94%) [1, 4, 9]. No comparison can be done for hemiarthroplasties and total revision as the only register that collects these data is Australian, but it has a shorter follow-up. It can also be questioned whether revision is a too crude endpoint, but we do agree with the decision of the Scandinavian registers as it would be practically impossible to choose other parameters, such as clinical data or X-ray findings, and make all surgeons report with the same score.

The major problems in managing the RIPO are quality of data and costs, which are partially interconnected. Maintaining a detailed and accurate database is a costly proposition. Up to now, the cost of the RIPO has been covered by funds of the Institute Rizzoli and public grants; each registered operation has a rough cost ratio of 14:19 compared to the Norwegian register.

In our opinion the expense is justified by the advantages of monitoring the failures of surgical techniques and implants, which only a systematic register can do, in order to save on the number and cost of revisions. Many patients receive artificial joints each year, so that even a small decrease in the risk of revision would avoid a large number of unnecessary operations [5, 12].

Cases lost to follow-up represent another major problem of local registers [1, 4, 16]. We have solved this problem by telephonic checks directly to the patients and subsequent statistical analyses [16].

The main targets of the register have already been reached and others will be achieved as soon as follow-up increases. Currently, the register provides feedback to surgeons and the local health authorities on the early performance of implants, and it has already facilitated identification of individual patients who have received an implant in cases of urgent clinical review (zirconia balls and Hylamer components). The experience of RIPO is spreading, even if on a voluntary basis, since four other Italian regions (Toscana, Lazio, Campania, Puglia) have joined the register. The cohort of inhabitants has therefore reached 21,500,000, and annual total hip replacements 16,500. If

this trend is maintained we will hopefully have a national register in the next few years.

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Units	Doctors
<i>Province of Bologna</i>	
Public hospitals	
Istituti Ortopedici Rizzoli	Aldo Toni, Mario Mercuri, Ermanno Martucci, Maurillo Marcacci, Armando Giunti, Sandro Giannini, Mauro Girolami
Ospedale Maggiore	Stefano Boriani
Azienda Ospedaliera S. Orsola-Malpighi	Massimo Laus
Ospedale Bentivoglio	Luigi Prosperi
Ospedale Civile Vergato	Giovanni Serra
Ospedale Civile Imola	Guglielmo Licenzi
Private clinics	
Casa di cura "Villa Erbosa"	Marcello Acciario
Casa di cura "Villa Nigrisoli"	Sandro Uva
Casa di cura "Villa Torri"	Gian Luigi Gardini
Casa di cura "Villa Laura"	Giancarlo Caroli
Casa di cura "Villa Regina"	Sandro Uva
Casa di cura "Prof.Nobili"	Margherita Gallina
Casa di cura "Villa Chiara"	Corrado Ballerini
<i>Province of Ferrara</i>	
Public hospitals	
Azienda Ospedaliera Ferrara	Leo Massari
Ospedale Cento	Luigi Specchia
Ospedale Argenta	Pier Giorgio Vasina
Ospedale del Delta	Riccardo Faccini
<i>Province of Forli-Cesena</i>	
Public hospitals	
Ospedale Forli	Francesco Lijoi
Ospedale Cesena	Mauro Monesi
Private clinics	
Casa di cura "Villa Serena"	Giovanni Gardini
Casa di cura "Malatesta Novello"	Gianluca Bersani
Casa di cura "S. Lorenzino"	Raffaele Bisulli
Casa di cura "Villa Igea"	Giuliana Vandi
<i>Province of Modena</i>	
Public hospitals	
Azienda Ospedaliera	Luigi Celli
Policlinico di Modena	
Ospedale S. Agostino-Estense	Antonio Vaccari
Ospedale Carpi	Eugenio Rossi Urtoler
Ospedale Mirandola	Franco Borselli
Ospedale Castelfranco Emilia	Gilberto Masetti
Ospedale Sassuolo	Mario Longo, Luigi Adriano Pederzini
Ospedale Vignola	Gilberto Masetti
Ospedale Pavullo	Mario Argazzi
Private clinics	
Hesperia Hospital	Stefano Reggiani
Casa di cura Prof.Fogliani	Angelo Rosi

Units	Doctors
<i>Province of Parma</i>	
Public hospitals	
Azienda Ospedaliera di Parma	Pietro Marengi, Giovanni Soncini, Francesco Ceccarelli
Ospedale Fidenza	Enrico Vaienti
Ospedale Borgo Val di Taro	Aldo Guardoli
Private clinics	
Casa di cura “Città di Parma”	Felice De Cristoforo
<i>Province of Piacenza</i>	
Public hospitals	
Ospedale Piacenza	Carlo Fioruzzi, Michael Memminger
Presidio Ospedaliero Val Tidone, Castel San Giovanni	Giuseppe Leddi
Presidio Ospedaliero Val D’Arda, Fiorenzuola D’Arda	Carlo Fioruzzi
<i>Province of Ravenna</i>	
Public hospitals	
Ospedale Ravenna	Aristide Guerra
Presidio Ospedaliero Lugo	Gabriele Zanotti
Ospedale Faenza	Maurizio Fontana
Private clinics	
Casa di cura “Domus Nova”	Gian Battista Roversi
Casa di cura “S. Francesco”	Nunzio D’Agnelli
Casa di cura “Villa Maria Cecilia”	Folco Galeati
Casa di cura “S. Pier Damiano”	Roberto Nonni
<i>Province of Reggio Emilia</i>	
Public hospitals	
Arcispedale Santa Maria Nuova, Reggio Emilia	Ettore Saba
Ospedale, Guastalla	Enrico Magnani
Ospedale Montecchio Emilia	Norberto Negri
Ospedale Scandiano	Roberto Fiocchi
Ospedale Castelnuovo Monti	Paolo Carretti
Private clinics	
Casa di cura “Villa Salus”	Sevag Uluhogian
Casa di cura “Villa Verde”	Alessandra Pradelli
<i>Province of Rimini</i>	
Public hospitals	
Ospedale Rimini	Giannicola Lucidi
Ospedale Riccione	Luigi D’Elia
Private clinics	
Casa di cura “Villa Maria”	Rosaria Stefania D’Urso
Casa di cura “Sol et Salus”	Pier Paolo Balli

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