

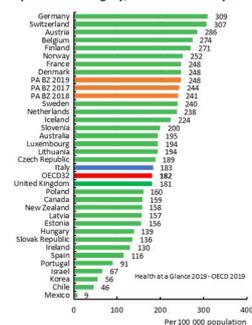
# OUTCOME ANALYSIS OF FIRST REVISIONS OF HIP REPLACEMENT SURGERIES. FIRST STUDY USING DATA FROM THE PROVINCIAL REGISTRY OF HIP PROSTHESES OF THE AUTONOMOUS PROVINCE OF BOLZANO (ITALY)

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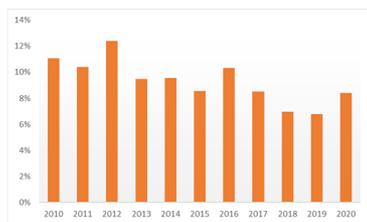
INTRODUCTION

Rate of incidence (per 100,000 inhabitants) of primary hip replacement surgery, 2017 or nearest year – OECD 2019



The Autonomous Province of Bolzano (PA BZ) has recorded one of the highest incidence rates of prosthetic hip surgery in Italy over the last decade with rates close to those of Northern European countries. Since 2010, the Provincial Registry of Hip Prostheses (PHAR) has been established, collecting data for each hip prosthesis intervention (primary and/or revision surgery).

Revision burden Hip prosthesis PA BZ (2010-2020)



Kaplan-Meier revision rate estimates (1-5y) elective Hip prosthesis PA BZ (2010-2020)

Period	Revision rate (%)	CI (95%)
Whitin 1 year	1.4	(1.1 – 1.7)
Whitin 2 years	1.9	(1.6 – 2.3)
Whitin 3 years	2.4	(2.1 – 2.8)
Whitin 4 years	2.6	(2.3 – 3.1)
Whitin 5 years	3.0	(2.6 – 3.4)

Despite the small number of cases, it has been possible to calculate in recent years – like the more established international registers - indicators relating to hip prosthesis revisions, such revision burden and revision rates.

This study represents a first attempt to analyze the outcomes after first revisions, both in terms of second revision risk and mortality risk.

METHOD

The PHAR contains 1,269 recorded revision forms. Of these, only 981 cases (77.3%) can be classified as "first revisions". These are selected as the first revision forms that can be associated to a patient in chronological order. In the case of revision forms that cannot be assigned a primary intervention in PHAR (because it may have occurred in a period prior to 2010, the year of establishment of PHAR), only those forms with "first revision" indicated in the corresponding "Revision number" field are selected.

Starting from all the first revisions of the PHAR during the period 01.01.2010 to 31.12.2020, the risks of a second revision (R2R) and mortality after the first revision (MR), both within 1 year, were estimated using the Kaplan Meier method (KM).

Subsequently, R2R and MR were also estimated using the Cox Proportional-Hazard Model, taking into account the following risk factors (covariates): gender, age, reason for first revision (RFFR), ASA (patient severity index score of the American Society of Anesthesiologists), length of hospitalization at first revision and rehabilitation admission within 7 days of first revision.

Descriptive data of the first-revisions & of mortality (2010-2020)

	Ri-revision within 1 year			Mortality within 1 year		
	yes	no	p-value	yes	no	p-value
Number	76	905		44	937	
Age [median, IQR]	77 [69-80]	74 [67-81]	≤ 0.001	82 [76-86]	74 [67-80]	≤ 0.001
Length of hosp. [median, IQR]	14 [9 -22]	11 [8-15]	0.052	12 [9 -19]	11 [8-15]	0.052
Female (%)	38 (50.0)	471 (51.7)	0.540	25 (56.8)	484 (51.7)	0.540
Periprosthetic fracture (%)	19 (25.0)	126 (13.9)	0.001	15 (34.1)	130 (13.9)	0.001
ASA score ≥ 3 (%)	9 (11.8)	114 (12.6)	≤ 0.001	20 (45.5)	103 (11.0)	≤ 0.001
Rehab adm. within 7 dd (%)	40 (52.6)	429 (47.4)	1.000	21 (47.7)	448 (47.7)	1.000

Source: PHAR

Of the 981 cases of first revision, 76 cases (7.7%) underwent a second revision within one year. The 1-year R2R, estimated with Kaplan-Meier, corresponds to 8.0% (95% CI: 6.4-9.9) and the MR at 1 year to 4.6% (95% CI 3.4-6.1). Older age groups are associated with the increase of MR, while they do not seem to be for R2R. The RFFR "periprosthetic fracture" seems to be an important factor for R2R, and – together with the "dislocation" – also for the increase of MR.

For a more detailed analysis, the Cox Proportional Hazard model was adopted.

Kaplan-Meier estimates of revision rate for second revision after 1 year (R2R) & estimates of mortality rate after first revision after 1 year (MR)

	2 <sup>nd</sup> REVISION-RATE		MORTALITY AFTER 1 <sup>st</sup> REVISION	
	R2R (%)	CI (95%)	MR (%)	CI (95%)
<b>OVERALL</b>	<b>8.0</b>	<b>(6.4 – 9.9)</b>	<b>4.6</b>	<b>(3.4 – 6.1)</b>
<b>GENDER</b>				
F	7.7	(5.7 – 10.4)	5.0	(3.4 – 7.4)
M	8.3	(6.1 – 11.2)	4.1	(2.6 – 6.3)
<b>AGE CLASS</b>				
0-69	6.8	(4.4 – 10.3)	1.0	(0.3 – 3.1)
70-79	8.1	(5.7 – 11.3)	2.9	(1.6 – 5.1)
≥ 80	9.2	(6.3 – 13.3)	10.7	(7.6 – 15.0)

REASON FOR 1ST REVISION

	R2R (%)	CI (95%)	MR (%)	CI (95%)
Painful prosthesis	8.1	(3.7 – 17.1)	1.3	(0.2 – 9.0)
Aseptic loosening	5.2	(3.4 – 7.9)	2.7	(1.5 – 4.9)
Rupture of the implant	9.2	(3.6 – 22.7)	2.4	(0.3 – 15.7)
Implant wear	7.9	(4.0 – 15.1)	1.0	(0.1 – 6.7)
Dislocation	12.7	(6.8 – 23.1)	13.3	(7.4 – 23.3)
Periprosthetic fracture	13.7	(8.9 – 20.6)	10.5	(6.5 – 16.8)
Infection	11.3	(6.0 – 20.6)	4.9	(1.9 – 12.6)
Other	0.0	(0.0 – 0.0)	2.5	(0.4 – 16.5)

Cox Proportional Hazard Model of second revision within 1 year after first revision (R2R) (p<0.05)

	Ri-revision within 1 year		HR adj	p-value
	HR	p-value		
Age	1.12 [0.99-1.03]	0.2793	1.00 [0.98-1.03]	0.8684
Length of hospitalization	1.03 [1.02-1.05]	0.0000	1.03 [1.02-1.05]	0.0000
Female (vs. Male)	0.93 [0.59-1.45]	0.7407	0.81 [0.51-1.30]	0.3842
Periprosthetic fracture (vs. other RFFR)	2.01 [1.19-3.37]	0.0087	1.78 [1.02-3.10]	0.0425
ASA score ≥ 3 (vs. ASA ≤ 2)	0.94 [0.47-1.88]	0.8589	0.73 [0.36-1.51]	0.3989
Rehab adm. within 7 dd (vs. no rehab admission)	1.22 [0.78-1.91]	0.3897	1.17 [0.73-1.87]	0.5199

Cox Proportional Hazard Model of mortality within 1 year after first revision (MR) (p<0.05)

	Mortality within 1 year		HR adj	p-value
	HR	p-value		
Age	1.11 [1.07-1.15]	0.0000	1.09 [1.04-1.13]	0.0000
Length of hospitalization	1.03 [1.02-1.05]	0.0000	1.03 [1.01-1.05]	0.0126
Female (vs. Male)	1.22 [0.67-2.22]	0.5082	0.88 [0.47-1.68]	0.7110
Periprosthetic fracture (vs. other RFFR)	3.11 [1.67-5.80]	0.0003	1.75 [0.88-3.49]	0.1133
ASA score ≥ 3 (vs. ASA ≤ 2)	6.27 [3.46-11.35]	0.0000	3.54 [1.89-6.62]	0.0000
Rehab adm. within 7 dd (vs. no rehab admission)	0.99 [0.55-1.79]	0.9785	0.60 [0.33-1.11]	0.1020

Using the Cox Proportional Hazard Model, the RFFR "periprosthetic fracture" results significant for R2R within one year, as well as the length of the hospitalization of the first revision intervention.

Age, length of hospitalization and patients with ASA class ≥ 3 are the risk factors that significantly influence MR. Gender and the subsequent hospitalization in a rehabilitation facility within 7 days of discharge from the first revision intervention, did not prove to be risk factors for R2R, nor for MR.

CONCLUSIONS

Patients with a periprosthetic fracture as the reason for the 1<sup>st</sup> revision (RFFR) have a 78% higher risk than patients with other RFFRs to perform a second revision within one year. As expected, the MR within one year increases with age (+9% for each year) and an "ASA score ≥ 3" more than 3 times respect to the patients with ASA score ≤ 2. The length of hospitalization during the first revision emerges as a significant risk factor for both R2R and MR. The study presents the limits of low numbers (typical for a regional registry) and needs additional clinical variables to be included in the model.

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