The IFSO Global Registry

Second
IFSO Global
Registry Report

2016

Prepared by
Richard Welbourn
John Dixon
Kelvin Higa
Robin Kinsman
Johan Ottosson

Almino Ramos
Bart van Wagensveld
Peter Walton
Rudolf Weiner
Natan Zundel

IFSO & Dendrite Clinical Systems Ltd
The International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) operates the IFSO Global Registry in partnership with Dendrite Clinical Systems Limited. The Society gratefully acknowledges the assistance of Dendrite Clinical Systems for:

- building, maintaining & hosting the data-entry web portals
- data analysis and
- publishing this report

Dendrite Clinical Systems Ltd is registered under the Data Protection Act;
Data Protection Act Registration Register Number Z88 55 307

This document is proprietary information that is protected by copyright. All rights reserved. No part of this document may be photocopied, stored in a retrieval system, transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the permission of the publishers and without prior written consent from The International Federation for the Surgery of Obesity and Metabolic Disorders and Dendrite Clinical Systems Limited.

Price: US$40.00
September 2016 A catalogue record for this book is available from the British Library
ISBN 978-0-9929942-1-1

Published by Dendrite Clinical Systems Ltd
The Hub, Station Road, Henley-on-Thames,
Oxfordshire RG9 1AY, United Kingdom
phone +44 1491 411 288
fax +44 1491 411 377
e-mail publishing@e-dendrite.com

Printed and bound by
Preface

Bariatric and/or metabolic surgery, has reached a point where the expanding evidence base of high-quality randomized controlled trials and longitudinal studies, such as the Swedish Obese Subjects study, make the case for surgery ever more compelling. However, we are at a crossroads, since the rate of surgery in public health systems is not increasing above a tiny fraction of those patients who fulfill the eligibility criteria.

As surgeons struggle to combat the epidemic of obesity worldwide and improve the lives of our patients with this disease, it is even more important to know on a global scale who we are operating on, why, and what procedures are being undertaken. The more we know, the better we will be able to help our patients, but, not only that, we will understand the global situation, and also the regional situation, and perhaps intervene through our members societies, to improve not only quality-of-care, but also the access of patients to suitable treatment.

After a successful Pilot Project, the IFSO Executive Council took the formal decision to fund a Global Registry in 2014, and this Second Report is the next logical step from the pioneering work of Drs Scopinaro, Buchwald, Angrisani, Weiner and others in their surveys of national society members from within the Federation. It is the next important step in describing and comparing the baseline characteristics and operative outcomes in large numbers of patients as we build up a more and more representative picture of what is happening around the world.

I know, first hand the difficulties and cost of collecting data. That's why we, the IFSO Executive Leadership team, decided to cover the cost of the collection, publication and delivery of such bariatric surgery data collected from around the world. We partnered with one of the leading clinical software companies in the world, who have extensive experience in this kind of process, so as to make it happen in the most professional way possible.

The response from our members and member societies has been pretty good, but lower than our expectations.

We believe that this initiative is an important part of the global response to the obesity epidemic, and we would like to encourage all national societies and individual surgeons to actively participate in the next iteration. We would like to offer our sincere thanks to all those who have submitted their data so far.

Personally, I truly believe that when you see the final product of these endeavours, all of you will not only benefit from this information, but also want to join this journey towards a truly Global Registry, which will ultimately be to the benefit of our patients.

Finally I want to thank all the members of the Data Registry Committee for all their hard work and offer a special thank you to Richard Welbourn and Peter Walton for their commitment and work throughout this Herculean task.

Natan Zundel

IFSO President
Foreword

The epidemic of obesity can no longer be ignored. Once perceived as penance for the sins of economically developed countries, it has attacked poorer, less advanced cultures with the same level of aggression.

Obesity is a global disease of unprecedented proportions, insidious in its penetrance, devastating in its consequences; not only through lives lost, but through its global effects on the economy. Through agriculture, domestication of livestock, genetic manipulation and chemical engineering, we have succeeded in replacing starvation with an equally harmful form of malnutrition - obesity.

Treatment of this disease is surprisingly difficult given the obvious, naive answer: eat less, exercise more. Despite evidence for the futility of this dictum and for the effectiveness of our surgical interventions, universal acceptance of surgical treatment has been elusive. Perhaps understandable, as we, ourselves, have incomplete evidence as to the patho-physiology of our interventions or precise long-term outcomes - and even less insight as to which operations will give the best performance in a given patient.

In the United States, as well as other countries, bariatric surgery registries have failed to capture enough data to be of significance. We, as surgeons, suffer from the same lack of insight as our critics - had we universally participated in such programs from the beginning, think how different the landscape would be today. The importance of the contribution made by longitudinal endeavours such as the Swedish Obese Subjects study cannot be over-emphasized. Data derived from Center of Excellence programs will not have the broad, long-range answers to the global questions that plague us. Surgeons will retire, programs will close as new ones emerge, and patients will change insurance or simply move to a new town. It is not feasible to rely upon a single practice to keep track of every patient forever. By contrast it is possible for a health care system to keep track of every patient who has had a bariatric/metabolic procedure and this should be among the highest of priorities.

The IFSO Global Registry is an important step in this direction. Every surgeon who performs a bariatric/metabolic procedure should consider participation a mandatory part of this specialty.

Kelvin Higa
IFSO President Elect
Introduction

It is a privilege to present data on baseline obesity-related disease, operation types, operative outcomes and disease status after bariatric surgery in over 140,000 patients accumulated from 31 local and national databases and registries from all over the world. This initiative of IFSO, the first of its kind, could help the bariatric community establish essential benchmark knowledge about the patients we are operating upon, their age and gender distributions, body mass index (BMI) and comorbidity disease burden, as well as track trends in surgery over time. The data are presented not as the standard abstract, introduction, methods, results, discussion and conclusions format of a peer-reviewed publication. Rather, using a small and necessarily far from comprehensive dataset, we present the data as simple tables and graphs using usually 2 variables, one for each axis, plus a dedicated commentary for each. Even though this is a very basic presentation of data, many of the results demonstrate clear and important differences in bariatric practice between countries.

A comprehensive Founding Charter has been set up regarding use and ownership of the accumulated and merged data, and contributors can be assured that we have steered well clear of attempting to make statistical comparisons between different units, and that their submitted data will not be misused. We are also fully aware of the inherent problems of over interpretation and reading too much into the data.

If there are to be further developments and reports for the IFSO Global Registry, attractive aims could also include agreeing and developing models of risk stratification and the setting of international benchmarks for post-operative complications or mortality. The registry could help in these aims by standardizing data collection. As it progresses, the data it contains might also be useful in influencing policy internationally and increasing service provision in countries where there is little or no bariatric surgery. I encourage all key stakeholders in bariatric surgery (especially surgeons, providers and commissioners of care) to embrace this data collection and reporting process at individual clinics and hospitals, and onwards/upwards at both national and international levels. It will require widespread involvement and on-going commitment from all those involved in the care of the bariatric patient to ensure high-quality data can be collected, properly analysed and shared, so that we will be better able to understand shifts in disease patterns, practice and outcomes on a global scale.

Thank you to all those surgeons who have committed their data for inclusion in this second report, your contribution is very much appreciated.

Bariatric surgery has great potential to improve health in a vast number of patients in a cost effective manner; however, it is made available to very few obese people who could benefit from it. Little is known internationally about which patients are being operated on, other than the worldwide survey of bariatric surgery undertaken by Prof. Scopinaro, Prof. Buchwald and more recently by Prof. Angrisani. Although we know from their surveys which operations are being performed, we do not yet know basic demographic data on variables such as gender distribution, starting BMI, and prevalence of comorbidities such as type 2 diabetes, hypertension and sleep apnea. Nor do we have any data on surgical outcomes such as survival, length-of-stay or improvement in comorbidities between different populations.

Therefore the aims of this project are to:

1. Establish baseline demographic characteristics for patients operated in different countries either from the respective national registries or individual units in these countries
2. Record basic 1-year post-operative data

The data presented are not intended to be a definitive global representation of bariatric surgery, as data from many countries with large volumes of surgery are not yet included. However, the report is the start of a process that shows what can be achieved within the constituent countries of IFSO. For instance, the data could in future be used to estimate inequalities of provision of surgery internationally, and provide benchmarks for access to surgery to those people with specific obesity-related disease such as diabetes.

Second IFSO Global Registry Report

Executive summary

This is the second comprehensive, international analysis of outcomes from bariatric (obesity) and metabolic surgery, gathered under the auspices of the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) in collaboration with Dendrite Clinical Systems.

In overview

- 31 countries from 5 continents contributed a total of 141,748 operation records; 54,490 of these records fell in the calendar years 2013-2015
- the number of records submitted ranged from 55 from a single centre to over 47,000 submitted by the national registry from the United Kingdom
- this précis reports on 82,264 gastric bypass operations (58% of all the records submitted), 36,263 sleeve gastrectomy procedures (25.6%), and 13,824 gastric banding operations (9.8%)
- most of the database records fell in the period 2009-2015 (88.5% of the total); 59,490 of operations were dated in the calendar years 2013-2015 (42.0%)

The dataset and completeness of data entry

- the simple dataset used for the previous IFSO report was extended slightly to include a total of 40 variables (28 baseline data-items; 12 in the follow-up section)
- overall, 62.4% of the baseline records were >80% complete for operations dated in the calendar years 2013-2015

Initial data from 2013-2015

Funding and gender inequality

- 58.3% of operations were funded by public health services; there was a great deal of variation in the rates of publicly-funded surgery across the contributor countries
- there was also a wide variation in the country-specific gender ratios, ranging from 54.2% female (in Brazil) to 80.3% female (in the Netherlands)

Primary operations and BMI range

- the patients’ average BMI pre-surgery was 44.7 kg m\(^{-2}\) (inter-quartile range: 39.4-48.8 kg m\(^{-2}\)); there was a wide variation between different contributor countries, ranging from 36.6 kg m\(^{-2}\) in Peru to 49.1 kg m\(^{-2}\) in Ireland
- patients’ average age was 42.0 years (inter-quartile range: 33.0-51.0 years)
- the overall proportion of female patients was 73.3% (95% CI: 73.0-73.7%)
- Switzerland (100.0%), Sweden (92.8%) and Mexico (86.7%) reported the highest proportions of gastric bypass surgery; Peru (100.0%), Saudi Arabia (100.0%) and Qatar (100.0%) reported the highest rates of sleeve gastrectomy operations
- 97.8% of all operations were performed laparoscopically
- 88.1% of patients who had a gastric band inserted were discharged within 1 day of their operation; after gastric bypass, 75.4% of patients were discharged within 2 days of surgery; and 86.8% of sleeve gastrectomy patients went home within 3 days of their operation
Comorbidities prior to surgery

- 22.0% of patients were on medication for type 2 diabetes (inter-country variation: 7.4-63.2%)
- 31.9% were treated for hypertension (inter-country variation: 15.8-92.7%)
- 17.6% of patients were on medication for depression (inter-country variation: 0.0-46.3%)
- 27.8% of patients required treatment for musculo-skeletal pain (inter-country variation: 0.0-58.9%)
- 18.9% of patients had sleep apnea (inter-country variation: 0.0-63.2%)
- 29.6% of patients had GERD (inter-country variation: 9.1-90.9%)

Stratification for operative risk

- the Obesity Surgery Mortality Risk Score (OSMRS) varied widely by country
- Turkey, Ireland and Hong Kong had the highest-risk patient populations (OSMRS groups B & C: 57.9%, 56.9% and 55.1% respectively)
- Peru, the Netherlands and Panama appeared to have the least risk (OSMRS groups B & C: 22.2%, 23.9% and 26.0% respectively)

Follow up data for primary surgery carried out in the calendar years 2009-2015

- there were 189,141 valid follow up records
- average percentage excess weight loss was 72.4% one year after surgery
- the corresponding percentage weight loss was 30.4% one year after surgery
- one year after primary surgery 64.7% of those taking medication for type 2 diabetes beforehand were no longer on medication; the proportion of patients no longer treated for diabetes was highly dependant on weight loss achieved
- there were also significant reductions in the rates of treatment for depression, hypertension and musculo-skeletal pain
- rates of confirmed sleep apnea and GERD also fell one year after bariatric surgery

Implications for bariatric surgery

- a simple dataset and the willingness of many centres in different countries to contribute can lead to a large body of pooled and merged data
- this second report quantifies the gender inequality evident worldwide and also shows inequality of access to surgery in many countries
- on the scale of a large international collaboration, the data on improvement in diabetes demonstrate the profound treatment effect that bariatric surgery has on this disease
- therefore, this initiative may be useful in advancing the status and acceptability of bariatric surgery worldwide and suggests many international research projects that could be undertaken
WHO data

The chart below shows the inexorable increase in obesity rate among the OECD countries. Baseline prevalence of obesity varies greatly with global region, but the trends are the same. Unfortunately obesity prevalence tells only part of the story as a doubling of the obesity rate in a country typically generates a 3-fold increase in the prevalence of a BMI >35 kg m\(^{-2}\), a 5 fold increase of a BMI >40 kg m\(^{-2}\), and a 9-10 fold increase in individuals with a BMI >50 kg m\(^{-2}\). Of course, these trends are not restricted to developed countries, but are universal as indicated in the recent NCD (non-communicable diseases) collaborative data from 200 countries following 19.2 million participants \(^2\). The data indicate a global exponential increase in the numbers of people with obesity, and severe obesity especially in women, between 1975 & 2014. Sadly there is no hint that trends are changing. This continuing epidemic is driving an extraordinary increase in the rates obesity-related complications such as type 2 diabetes, cardiovascular disease and specific cancers.

Bariatric-metabolic surgery is one of few highly effective tools to manage this growing burden of chronic disease. However, there are major ethnic and regional differences in the pattern of obesity related complications and the BMI that generates the risk of these. There may also regional differences in the choice of surgery resulting from cultural acceptability, team skills and resources available, ethnic differences in the response to specific surgical procedures, and regional risks of specific GI malignancies.

![OECD data: Obesity rates over time](image)

A key element in the delivery of care to those in need and most likely to benefit will be an understanding of surgical risk-to-benefit throughout the life-cycle, and the influence of obesity-related complications on this analysis. This will assist in clarifying individual patient selection, but also guide the issue of surgical eligibility versus recommendation. Limited resources, an overwhelming need, and the preponderance of whole of community delivery of health services in developed countries will drive a priority for surgical recommendation rather than eligibility.

To address these national and regional issues it is important to pool our resources and understand the delivery of bariatric-metabolic surgery on a global basis. The IFSO international registry provides a vital component in monitoring the response to this epidemic.


Global prevalence of obesity

The next four graphs show the latest data available for the prevalence of obesity (defined as body mass index of [≥30 kg m⁻²]) by gender from the World Health Organisation (apps.who.int/gho/data/node.main.A900A?lang=en). Together with the graph on the previous page they illustrate the severity of the problem affecting all, especially the more developed, countries.

Here we see the countries with the lowest prevalence of obesity. However, two contributors to the registry, China and India, have the greatest burden of type 2 diabetes globally with approximately 100 million and 70 million people respectively. The difference in the prevalence between men and women is clear and consistent throughout these countries that currently exhibit the lowest levels of obesity.

<table>
<thead>
<tr>
<th>Countries that submitted data to the IFSO Global registry</th>
<th>Countries that did not submit data to the IFSO Global registry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>Women</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Countries that submitted data to the IFSO Global registry</th>
<th>Countries that did not submit data to the IFSO Global registry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>Women</td>
</tr>
</tbody>
</table>

WHO data: Gender & age standardised rates of obesity by country; countries ordered by increasing rates of obesity in the female population; people over the age of 17; data from the year 2014

Percentage of men who are obese

Percentage of women who are obese

Global prevalence of obesity

The next four graphs show the latest data available for the prevalence of obesity (defined as body mass index of [≥30 kg m⁻²]) by gender from the World Health Organisation (apps.who.int/gho/data/node.main.A900A?lang=en). Together with the graph on the previous page they illustrate the severity of the problem affecting all, especially the more developed, countries.

Here we see the countries with the lowest prevalence of obesity. However, two contributors to the registry, China and India, have the greatest burden of type 2 diabetes globally with approximately 100 million and 70 million people respectively. The difference in the prevalence between men and women is clear and consistent throughout these countries that currently exhibit the lowest levels of obesity.
Countries represented on this page are from a range of regions. It is easy to recognise the European countries as it is in these countries that the prevalence of obesity in men is similar to or even exceeds that in the female population.

There are many developed countries contributing to the registry in this group of countries. It is noticeable that the gender divide in obesity prevalence is greatest in the sub-Saharan African nations.

WHO data: Gender & age standardised rates of obesity by country; countries ordered by increasing rates of obesity in the female population; people over the age of 17; data from the year 2014

Countries that submitted data to the IFSO Global registry
Countries that did not submit data to the IFSO Global registry
WHO data: Gender & age standardised rates of obesity by country; countries ordered by increasing rates of obesity in the female population; people over the age of 17; data from the year 2014

<table>
<thead>
<tr>
<th>Countries that submitted data to the IFSO Global registry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estonia, Turkmenistan, Nicaragua, Yemen, Greece, Guatemala, Hungary, France, Georgia, Lesotho, Croatia, Honduras, Mauritius, Bulgaria, Spain, Kazakhstan, Latvia, Ireland, Belarus, Slovenia, Colombia, Cyprus, Azerbaijan, Peru, Poland, Slovakia, El Salvador, Israel, Czech Republic, Russian Federation, Swaziland, Namibia, Lithuania, Morocco, Malta, Australia, Belize, Argentina, Canada, United Kingdom, Venezuela, Costa Rica, Dominican Republic, Syrian Arab Republic, Andorra, Iraq, Uruguay, Algeria</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Countries that did not submit data to the IFSO Global registry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estonia, Turkmenistan, Nicaragua, Yemen, Greece, Guatemala, Hungary, France, Georgia, Lesotho, Croatia, Honduras, Mauritius, Bulgaria, Spain, Kazakhstan, Latvia, Ireland, Belarus, Slovenia, Colombia, Cyprus, Azerbaijan, Peru, Poland, Slovakia, El Salvador, Israel, Czech Republic, Russian Federation, Swaziland, Namibia, Lithuania, Morocco, Malta, Australia, Belize, Argentina, Canada, United Kingdom, Venezuela, Costa Rica, Dominican Republic, Syrian Arab Republic, Andorra, Iraq, Uruguay, Algeria</td>
</tr>
</tbody>
</table>

Percentage of men who are obese | Percentage of women who are obese
---|---
60% | 50%
50% | 40%
40% | 30%
30% | 20%
20% | 10%
10% | 0%
0% | 0%
0% | 10%
10% | 20%
20% | 30%
30% | 40%
40% | 50%
50% | 60%
The countries represented here are those with the highest prevalence of obesity globally. Regions are very distinct and include the Pacific Islands, the Middle East, the United States, Mexico, Caribbean Islands, and parts of Central and South Americas.

**WHO data: Gender & age standardised rates of obesity by country; countries ordered by increasing rates of obesity in the female population; people over the age of 17; data from the year 2014**

*Countries that submitted data* to the IFSO Global registry

*Countries that did not submit data* to the IFSO Global registry

---

**Men**

- New Zealand
- St Vincent & the Grenadines
- Cuba
- Guyana
- Iran
- Chile
- Botswana
- Suriname
- Dominica
- Mexico
- Panama
- Papua New Guinea
- Solomon Islands
- Tunisia
- St Lucia
- Grenada

**Women**

- United States of America
- St Kitts & Nevis
- Jamaica
- Turkey
- Seychelles
- South Africa
- Egypt
- Lebanon
- Oman
- Trinidad & Tobago
- Barbados
- Jordan
- Antigua & Barbuda
- Libya
- Saudi Arabia
- Vanuatu
- Fiji
- Bahamas
- Bahrain
- Micronesia

---

**Percentage of men who are obese**

- 60%
- 50%
- 40%
- 30%
- 20%
- 10%
- 0%

**Percentage of women who are obese**

- 0%
- 10%
- 20%
- 30%
- 40%
- 50%
- 60%
Contributors

Following the success of the initial IFSO Pilot Global Registry (which reported results at the IFSO meeting in Montreal in 2014), Dr Natan Zundel, the President of IFSO, extended a personal invitation to every IFSO member country National President to encourage their Society to join the registry. Just over 50% of the invited countries were willing and able to contribute data. In addition, two national Society Presidents indicated that while they could not submit this year, they would be prepared to do so in future years.

New national registries joining the project included India, Israel, the Netherlands and Turkey. In some countries only one or two individual bariatric surgery centres were able to supply data, usually because no national registry yet exists. This does mean that the data supplied may well not be representative of practice across those countries and hence the resulting analyses must be viewed with caution.

The map below is only intended to give an impression of the geographic spread of the contributors to the IFSO Global Registry. It does show that the data for this project have come from a widespread and diverse group of countries. Some of these contributor countries have data coming from a single centre, whereas others have sent data from their National Registry, covering up to 100% of bariatric surgery in that particular country.

The countries in grey have not provided any data to the IFSO Global Registry as yet.

The table spread across these two pages shows exactly which countries, in which continental region, successfully submitted data either as national registries or as individual contributors. A full list of the contributors on a named hospital basis, by country, is available in the Appendix on pages 40 to 45.
## Contributors to the IFSO Global Registry

<table>
<thead>
<tr>
<th>Region</th>
<th>Country</th>
<th>Operations</th>
<th>Data source</th>
</tr>
</thead>
<tbody>
<tr>
<td>S America</td>
<td>Brazil</td>
<td>1,185</td>
<td>Single centre</td>
</tr>
<tr>
<td></td>
<td>Chile</td>
<td>8,171</td>
<td>Multi-centre</td>
</tr>
<tr>
<td></td>
<td>Colombia</td>
<td>55</td>
<td>Multi-centre</td>
</tr>
<tr>
<td></td>
<td>Peru</td>
<td>358</td>
<td>Single centre</td>
</tr>
<tr>
<td>Europe</td>
<td>Czech Republic</td>
<td>1,319</td>
<td>Single centre</td>
</tr>
<tr>
<td></td>
<td>France</td>
<td>216</td>
<td>Single centre</td>
</tr>
<tr>
<td></td>
<td>Germany</td>
<td>472</td>
<td>Single centre</td>
</tr>
<tr>
<td></td>
<td>Ireland</td>
<td>375</td>
<td>Single centre</td>
</tr>
<tr>
<td></td>
<td>Italy</td>
<td>2,398</td>
<td>Single centre</td>
</tr>
<tr>
<td></td>
<td>Lithuania</td>
<td>67</td>
<td>Single centre</td>
</tr>
<tr>
<td></td>
<td>Netherlands</td>
<td>6,742</td>
<td>National Registry</td>
</tr>
<tr>
<td></td>
<td>Russia</td>
<td>2,343</td>
<td>National Registry</td>
</tr>
<tr>
<td></td>
<td>Spain</td>
<td>656</td>
<td>Single centre</td>
</tr>
<tr>
<td></td>
<td>Sweden</td>
<td>34,844</td>
<td>National Registry</td>
</tr>
<tr>
<td></td>
<td>Switzerland</td>
<td>2,029</td>
<td>Single centre</td>
</tr>
<tr>
<td></td>
<td>Turkey</td>
<td>906</td>
<td>New National Registry</td>
</tr>
<tr>
<td></td>
<td>United Kingdom</td>
<td>47,064</td>
<td>National Registry</td>
</tr>
<tr>
<td>Middle East</td>
<td>Israel</td>
<td>8,996</td>
<td>National Registry</td>
</tr>
<tr>
<td></td>
<td>Jordan</td>
<td>280</td>
<td>Single centre</td>
</tr>
<tr>
<td></td>
<td>Kuwait</td>
<td>1,000</td>
<td>Single centre</td>
</tr>
<tr>
<td></td>
<td>Qatar</td>
<td>100</td>
<td>Single centre</td>
</tr>
<tr>
<td></td>
<td>Saudi Arabia</td>
<td>4,167</td>
<td>Single centre</td>
</tr>
<tr>
<td></td>
<td>United Arab Emirates</td>
<td>1,052</td>
<td>Single centre</td>
</tr>
<tr>
<td>Asia</td>
<td>China</td>
<td>726</td>
<td>Single centre</td>
</tr>
<tr>
<td></td>
<td>Hong Kong</td>
<td>608</td>
<td>Multi-centre</td>
</tr>
<tr>
<td></td>
<td>India</td>
<td>2,888</td>
<td>New National Registry</td>
</tr>
<tr>
<td></td>
<td>Taiwan</td>
<td>6,769</td>
<td>Multi-centre</td>
</tr>
</tbody>
</table>
Mechanics

New contributor invitees were sent an IFSO Global Registry Charter document that outlined and explained:

- aims of the Dendrite / IFSO Global Registry Project
- data protection
- access
- data ownership
- publication and other use of the data
- principles of operation: roles and responsibilities
- data validation
- supervising authorities

Once each invitee had returned their signed Charter document, for those that had the capability to upload data electronically, each was then sent a unique contributor submit identifier code, a username and password to access the dedicated Dendrite / IFSO Upload-My-Data portal, and four key documents:

1. **The Database Form**: to provide a quick overview of the central database design. This is available in the Appendix in this report on pages 46 to 48.


3. **The Data Dictionary**: detailing the data definitions of the database answer options.

4. **The User Manual**: to explain how the Upload-My-Data software can be used.

All these documents are available on-line at:

rs2.e-dendrite.com / CSP / PUBLIC / DocPublic / UploadMyData / IFSO2 / ifso2.csp

For those centres without a local database, Dendrite constructed and provided an on-line database system accessible over the Internet. This portal enables surgeons/data managers to enter cases (with anonymised patient identifiers) using a simple on-line data form with just 4 pages of questions, that typically takes just 3-4 minutes to complete per patient record.

The Dendrite Upload-My-Data software platform is a proven interface, designed to enable a community of surgeons or physicians to create a national or international database; even if there are different database systems at the local level, the data from each can be integrated into the central, merged registry. This platform has been successfully utilised in a number of other national and international registries (e.g., for cardiac surgery, thoracic surgery) and has been specifically tailored for the IFSO project to enable both individual centres and national registries to submit data in batches on-line.

The software has been designed to walk the user through a series of simple steps using a menu structure and on-screen instructions from an initial Welcome Page through a series of file and data validation checks to a final Data Commit page and a Summary Screen that provides a brief précis of the data received in the central IFSO Global Registry following each upload.

The diagram opposite illustrates the fact that most countries (and all national databases) were successfully able to upload data electronically through this Upload-My-Data web portal.

By combining the data from the Upload-My-Data area with the data submitted on-line case-by-case, through the Direct-Data-Entry module, it was then possible to run the analyses on data gathered from 31 countries as illustrated in this report.

The next step is to create and publish some dynamic on-line analyses so that these can be accessed anywhere in the world where there is an Internet connection. The design and publication work for this task is on-going.
The merging process
Data completeness

Mandatory questions (required to create an entry on the database) were:

- the patient's date-of-birth or age in years
- the patient's gender
- the patient's height
- date-of-operation
- operative approach
- type of operation

This table shows the completeness of data submitted in the required electronic format for inclusion in the report. There was wide variation; this could either be due to the specific data-point not being included in the patient record that was uploaded to the Global Registry, or the data were left out of initial entry into the local database. Some apparently missing data reported here may represent a simple incompatibility between the local database and the central IFSO registry, rather than representing a complete absence of information at the local level. For

Non-mandatory data in the IFSO Global Registry

<table>
<thead>
<tr>
<th>Contributor country</th>
<th>Brazil</th>
<th>Canada</th>
<th>Chile</th>
<th>China</th>
<th>Colombia</th>
<th>Czech Republic</th>
<th>France</th>
<th>Germany</th>
<th>Hong Kong</th>
<th>India</th>
<th>Ireland</th>
<th>Israel</th>
<th>Italy</th>
<th>Jordan</th>
<th>Kuwait</th>
<th>Lithuania</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic patient details</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial weight</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td>Funding</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
</tr>
</tbody>
</table>

| **Comorbidities** |        |        |       |       |          |                |        |         |           |       |         |        |       |        |        |           |
| Type 2 diabetes    | ▼       | ▼       | ▼     | ▼     | ▼        | ▼              | ▼      | ▼       | ▼         | ▼    | ▼       | ▼      | ▼    | ▼       | ▼      | ▼         |
| Hypertension       | ▼       | ▼       | ▼     | ▼     | ▼        | ▼              | ▼      | ▼       | ▼         | ▼    | ▼       | ▼      | ▼    | ▼       | ▼      | ▼         |
| Depression         | ▼       | ▼       | ▼     | ▼     | ▼        | ▼              | ▼      | ▼       | ▼         | ▼    | ▼       | ▼      | ▼    | ▼       | ▼      | ▼         |
| DVT risk           | ▼       | ▼       | ▼     | ▼     | ▼        | ▼              | ▼      | ▼       | ▼         | ▼    | ▼       | ▼      | ▼    | ▼       | ▼      | ▼         |
| Musculo-skeletal pain | ▼       | ▼       | ▼     | ▼     | ▼        | ▼              | ▼      | ▼       | ▼         | ▼    | ▼       | ▼      | ▼    | ▼       | ▼      | ▼         |
| Sleep apnea        | ▼       | ▼       | ▼     | ▼     | ▼        | ▼              | ▼      | ▼       | ▼         | ▼    | ▼       | ▼      | ▼    | ▼       | ▼      | ▼         |
| GERD               | ▼       | ▼       | ▼     | ▼     | ▼        | ▼              | ▼      | ▼       | ▼         | ▼    | ▼       | ▼      | ▼    | ▼       | ▼      | ▼         |

| **Surgery** |        |        |       |       |          |                |        |         |           |       |         |        |       |        |        |           |
| Weight at surgery | ▲       | ▲       | ▲     | ▲     | ▲        | ▲              | ▲      | ▲       | ▲         | ▲    | ▲       | ▲      | ▲    | ▲       | ▲      | ▲         |
| Previous surgery  | ▼       | ▼       | ▼     | ▼     | ▼        | ▼              | ▼      | ▼       | ▼         | ▼    | ▼       | ▼      | ▼    | ▼       | ▼      | ▼         |

| **Outcomes** |        |        |       |       |          |                |        |         |           |       |         |        |       |        |        |           |
| Leak           | ▼       | ▼       | ▼     | ▼     | ▼        | ▼              | ▼      | ▼       | ▼         | ▼    | ▼       | ▼      | ▼    | ▼       | ▼      | ▼         |
| Bleed          | ▼       | ▼       | ▼     | ▼     | ▼        | ▼              | ▼      | ▼       | ▼         | ▼    | ▼       | ▼      | ▼    | ▼       | ▼      | ▼         |
| Obstruction    | ▼       | ▼       | ▼     | ▼     | ▼        | ▼              | ▼      | ▼       | ▼         | ▼    | ▼       | ▼      | ▼    | ▼       | ▼      | ▼         |
| Reoperation    | ▼       | ▼       | ▼     | ▼     | ▼        | ▼              | ▼      | ▼       | ▼         | ▼    | ▼       | ▼      | ▼    | ▼       | ▼      | ▼         |
| Status at discharge | ▼       | ▼       | ▼     | ▼     | ▼        | ▼              | ▼      | ▼       | ▼         | ▼    | ▼       | ▼      | ▼    | ▼       | ▼      | ▼         |
| Date of discharge | ▼       | ▼       | ▼     | ▼     | ▼        | ▼              | ▼      | ▼       | ▼         | ▼    | ▼       | ▼      | ▼    | ▼       | ▼      | ▼         |

Key (complete data) ▲ 100.0% ▼ 90.0-99.9% ▻ 10.0-89.9% ▼ 0.1%-10.0% ▼ 0.00%
example, the National Bariatric Surgery Registry in the United Kingdom does record operative complications, but not in a suitable format to map into the IFSO Global Registry. In some countries data were missing or unavailable for the purposes of this report in over 90% patients. Missing patient records, incomplete data entry and erroneous entries are major concerns, and act as impediments to meaningful and accurate reporting of outcomes. Some countries may have dedicated administrative staff who are able to check every record; however, it is unlikely that this is the case in perhaps the majority of countries submitting data here. The quality of data might be expected to improve in future, but it is important to state that the purpose of this second report is not to provide benchmarks nor quality control; rather, it is intended to demonstrate that data can be submitted successfully to a central registry and useful basic analyses can be performed. It is remarkable that so many of the data fields are shared between different registries and are over 90% complete (the solid green triangles in the table). The term musculo-skeletal pain was chosen as a generic term for all related conditions, so as to be inclusive, and collect as much data as possible on this comorbidity. Confirmed sleep apnea includes only patients on therapy. The full question titles and corresponding response-options are documented in the Appendix at the end of this report.

Non-mandatory data in the IFSO Global Registry

<table>
<thead>
<tr>
<th>Contributor country</th>
<th>Mexico</th>
<th>Netherlands</th>
<th>Panama</th>
<th>Peru</th>
<th>Qatar</th>
<th>Russia</th>
<th>Saudi Arabia</th>
<th>Spain</th>
<th>Sweden</th>
<th>Switzerland</th>
<th>Taiwan</th>
<th>Turkey</th>
<th>United Arab Emirates</th>
<th>United Kingdom</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic patient details</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial weight</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td>Funding</td>
<td>▲</td>
<td>▼</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▼</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td><strong>Comorbidities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type 2 diabetes</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td>Hypertension</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td>Depression</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td>DVT risk</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td>Musculo-skeletal pain</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td>Sleep apnea</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td>GERD</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td><strong>Surgery</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight at surgery</td>
<td>▲</td>
<td>▼</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td>Previous surgery</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td><strong>Outcomes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leak</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td>Bleed</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td>Obstruction</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td>Reoperation</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td>Status at discharge</td>
<td>▲</td>
<td>▼</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td>Date of discharge</td>
<td>▲</td>
<td>▼</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
</tr>
</tbody>
</table>

Key (complete data) ▲ 100.0% ▼ 90.0-99.9% ▲ 10.0-89.9% ▼ 0.1%-10.0% ▼ 0.0%
Submissions

In this Second IFSO Global Registry Report 2016 data from over 140,000 patient records were submitted from 31 countries. The numbers submitted range from exports of data from existing national registries (e.g., Sweden and the United Kingdom) to individual units in other countries that might not be fully representative of overall existing practice in those countries.

However, this is the first time that data have been combined from so many countries. Thus, this is the start of an iterative process as data potentially accumulate over time. In future we hope to add data from more countries and describe accurately the demographics and prevalence of baseline obesity-related disease between different populations having bariatric surgery.

Clearly the data presented are also a snap-shot of surgery in many of the countries and are not the total volume of surgery performed. The data in the rest of the report are from the 3 calendar years 2013-15, so as to present the most recent information, indicated by the green column in the chart below.

![Chart showing Scope of data submitted](chart.png)

**IFS0 Global Registry: Scope of data submitted; excepting years with one operation record submitted**

- Some operation records pre-date the calendar year 2000
- All operations fall in the period 2000-2016
- Data submission in a single calendar year

---

**Contributor country**

- Brazil
- Canada
- Chile
- China
- Colombia
- Czech Republic
- France
- Germany
- Hong Kong
- **India**
- Ireland
- Israel
- Italy
- Jordan
- Kuwait
- Lithuania
- Mexico
- **Netherlands**
- Panama
- Peru
- Qatar
- Russia
- Saudia Arabia
- Spain
- **Sweden**
- Switzerland
- Taiwan
- **Turkey**
- United Arab Emirates
- **United Kingdom**
- United States

---

**Calendar year**

- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015
- 2016
The data below show the number of operations per contributing country in a logarithmic scale. Until we have more complete data for the total number of operations it is not possible to know how representative the data are for each country, especially for those countries submitting only a few patient records to the current report.

1. Please note that the emboldened country labels in charts represent the data that have been submitted from a National Registry.
Body Mass Index prior to surgery

The graph below shows that there is a wide variation in the initial BMI of patients having bariatric surgery in different countries. Germany, the United Kingdom and Ireland have the highest reported BMIs. As increasing BMI is generally associated with a greatest risk of operative complications and mortality, the graph clearly implies that there needs to be caution applied when comparing complication rates between series of patients from different countries. We do not attempt to make these analyses.

We have not sub-divided the pre-operative BMI by funding mechanism. Subsequent analyses would show if there are differences internationally between patients funded by public health or insurance based systems, compared to patients paying for surgery privately.
The data illustrate the differences in BMI before surgery in different continents. Although the inter-quartile ranges all overlap, South American patients appear to be less obese than European patients.

The data can be compared to the graph on page 24 showing the age at surgery in different countries.

This comparison graph of pre-operative BMI in 3 countries shows clearly the variation in populations being operated upon in different healthcare systems.
Demographics

The graph on this page shows the median age of patients at baseline for each of the contributing countries. The patients from Saudi Arabia have the lowest age at surgery, but the centre that submitted these data specialises in child & adolescent surgery, and so the age distribution data is unlikely be fully representative for this country.

Primary surgery in the calendar years 2013-2015: statistics in basic demographic data; all contributor countries are included

<table>
<thead>
<tr>
<th>Pre-operative demographics</th>
<th>Average (95% CI)</th>
<th>Median (IQR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age / years</td>
<td>42.0 (41.9-42.1)</td>
<td>42.0 (33.0-51.0)</td>
</tr>
<tr>
<td>Gender / % female</td>
<td>73.3 (73.0-73.7)</td>
<td></td>
</tr>
</tbody>
</table>

Primary surgery: Patients’ age at the time of surgery; calendar years 2013-2015 (n=51,775)

The graph on this page shows the median age of patients at baseline for each of the contributing countries. The patients from Saudi Arabia have the lowest age at surgery, but the centre that submitted these data specialises in child & adolescent surgery, and so the age distribution data is unlikely be fully representative for this country.
Comorbidity

Type 2 diabetes

Type 2 diabetes mellitus is the obesity-related disease that has attracted most attention in bariatric surgery due to the demonstrable improvement in diabetes control with surgery, and data suggesting that surgery is cost-effective. In publicly-funded healthcare systems, it may be that patients are being referred for surgery for these reasons, hence forming a substantial proportion of operated patients. This information constitutes basic demographic data as the bariatric community seeks to increase the provision of surgery for the increasing population with this comorbidity.

Interestingly China, India and Hong Kong have some of the largest proportions of diabetic patients, possibly relating to the greater susceptibility of Asian people to developing diabetes at lower BMI levels. The data need to be interpreted in the context of diabetes risk with ethnicity. It may also be that the diabetes story has been taken up as a driver for surgery in these countries, contrasting with some other countries where the proportion of patients with diabetes having surgery is much lower. This area of inequality of access to bariatric surgery is ripe for research.

New international guidelines state that bariatric surgery should be a recommended treatment for type 2 diabetes in patients with BMI of 40 kg m\(^{-2}\) or more.
Hypertension

Again, there is widespread variation in the prevalence of hypertension between the different countries, with Taiwan, Hong Kong and Qatar having the highest rates. In some countries hypertension is associated with diabetes as part of the Metabolic Syndrome. However, there is also strong ethnic propensity to one or the other condition. As hypertension is associated with central obesity, it would also be expected that this is a predictor of operative risk (more difficult laparoscopic surgery), and thus it is one of the factors included in the Obesity Surgery Mortality Risk Score (OSMRS) shown in the following section. Recording of the presence of hypertension is therefore needed as a prerequisite for comparing mortality between different series. The wide variation in the reported rates of hypertension between countries might indicate a need for standardization in the recording of blood pressure between different countries and surgical centres. This would be the key towards achieving accurate reporting and must also be a priority for international research in bariatric surgery in this area.
Other comorbidities

The table below show that the recorded rates of clinical depression, dyslipidemia, musculo-skeletal pain, sleep apnea and gastro-esophageal reflux disease in bariatric patients. Current data do not allow us to comment further on the different rates of treatment for depression in those having bariatric surgery in different countries.

Primary surgery in the calendar years 2013-2015: rates of other comorbidities pre-operatively

<table>
<thead>
<tr>
<th>Comorbidity</th>
<th>No</th>
<th>Yes</th>
<th>Unspecified</th>
<th>Rate (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>31,324</td>
<td>6,677</td>
<td>13,819</td>
<td>17.6% (17.2-18.0%)</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>24,332</td>
<td>6,838</td>
<td>20,650</td>
<td>21.9% (21.5-22.4%)</td>
</tr>
<tr>
<td>Musculo-skeletal pain</td>
<td>20,614</td>
<td>7,957</td>
<td>23,249</td>
<td>27.8% (27.3-28.4%)</td>
</tr>
<tr>
<td>Confirmed sleep apnea</td>
<td>34,958</td>
<td>8,130</td>
<td>8,732</td>
<td>18.9% (18.5-19.2%)</td>
</tr>
<tr>
<td>GERD</td>
<td>21,265</td>
<td>8,923</td>
<td>21,632</td>
<td>29.6% (29.0-30.1%)</td>
</tr>
</tbody>
</table>

Primary surgery: Patients on medication for depression prior to surgery; calendar years 2013-2015 (n=76,002)
Obesity Surgery Mortality Risk Score

The OSMRS (Obesity Surgery Mortality Risk Score) stratifies patients undergoing bariatric surgery into three categories depending on how many of the following risk factors they possess (each risk factor scores one point):

- male gender
- age ≥45 years at the time of surgery
- BMI >50 kg m⁻²
- hypertension
- risk factors for deep vein thrombosis / pulmonary embolism

Primary surgery in the calendar years 2013-2015: Obesity Surgery Mortality Risk Score; excludes those countries where all database entries have one or more data-items required by the OSMRS missing

<table>
<thead>
<tr>
<th>Contributor country</th>
<th>A (0-1)</th>
<th>B (2-3)</th>
<th>C (4-5)</th>
<th>Unspecified</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>96</td>
<td>96</td>
</tr>
<tr>
<td>Chile</td>
<td>574</td>
<td>205</td>
<td>3</td>
<td>150</td>
<td>932</td>
</tr>
<tr>
<td>China</td>
<td>89</td>
<td>46</td>
<td>2</td>
<td>390</td>
<td>527</td>
</tr>
<tr>
<td>France</td>
<td>68</td>
<td>34</td>
<td>6</td>
<td>0</td>
<td>108</td>
</tr>
<tr>
<td>Germany</td>
<td>51</td>
<td>28</td>
<td>2</td>
<td>0</td>
<td>81</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>61</td>
<td>74</td>
<td>1</td>
<td>0</td>
<td>136</td>
</tr>
<tr>
<td>India</td>
<td>25</td>
<td>12</td>
<td>3</td>
<td>1,310</td>
<td>1,350</td>
</tr>
<tr>
<td>Ireland</td>
<td>69</td>
<td>84</td>
<td>7</td>
<td>0</td>
<td>160</td>
</tr>
<tr>
<td>Israel</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6,922</td>
<td>6,922</td>
</tr>
<tr>
<td>Jordan</td>
<td>96</td>
<td>40</td>
<td>15</td>
<td>0</td>
<td>151</td>
</tr>
<tr>
<td>Mexico</td>
<td>43</td>
<td>42</td>
<td>5</td>
<td>128</td>
<td>218</td>
</tr>
<tr>
<td>Netherlands</td>
<td>3,701</td>
<td>1,135</td>
<td>25</td>
<td>1,846</td>
<td>6,707</td>
</tr>
<tr>
<td>Panama</td>
<td>37</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>Peru</td>
<td>112</td>
<td>31</td>
<td>1</td>
<td>3</td>
<td>147</td>
</tr>
<tr>
<td>Qatar</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>Russia</td>
<td>707</td>
<td>494</td>
<td>56</td>
<td>641</td>
<td>1,898</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2,888</td>
<td>2,888</td>
</tr>
<tr>
<td>Spain</td>
<td>20</td>
<td>18</td>
<td>3</td>
<td>41</td>
<td>82</td>
</tr>
<tr>
<td>Sweden</td>
<td>4,916</td>
<td>1,849</td>
<td>52</td>
<td>3</td>
<td>6,820</td>
</tr>
<tr>
<td>Switzerland</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>310</td>
<td>310</td>
</tr>
<tr>
<td>Taiwan</td>
<td>309</td>
<td>160</td>
<td>2</td>
<td>564</td>
<td>1,035</td>
</tr>
<tr>
<td>Turkey</td>
<td>295</td>
<td>372</td>
<td>34</td>
<td>31</td>
<td>732</td>
</tr>
<tr>
<td>United Arab Emirates</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>526</td>
<td>526</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>7,670</td>
<td>7,381</td>
<td>1,188</td>
<td>1,273</td>
<td>17,512</td>
</tr>
<tr>
<td>United States</td>
<td>1,226</td>
<td>1,085</td>
<td>66</td>
<td>0</td>
<td>2,377</td>
</tr>
<tr>
<td><strong>All</strong></td>
<td><strong>20,069</strong></td>
<td><strong>13,103</strong></td>
<td><strong>1,471</strong></td>
<td><strong>17,177</strong></td>
<td><strong>51,820</strong></td>
</tr>
</tbody>
</table>

The patient is given one point for each of the OSMRS risk factors and a cumulative score determined, giving a total score in the range zero to five; this score is grouped into one of three categories:

- **group A**: score 0-1 (low risk)
- **group B**: score 2-3 (moderate risk)
- **group C**: score 4-5 (high risk)

The comparison of operative risk and mortality between different series and different countries is problematic unless there is a way of stratifying for pre-operative risk. This may be relevant in the situation where systematic reviews and meta-analyses are undertaken when the baseline data are not comparable. The data in the graph show that there is, again, wide variation in OSMRS, an accepted risk-assessment tool, between different countries. As the IFSO Registry continues to gather data it may become representative of the whole operated population, and therefore will provide a benchmark for risk stratification in assessing outcomes. This graphical representation of operative risk also provides important baseline information for prioritisation of which patients should receive treatment in different countries.
## Surgery

### Type of surgery

These data can be compared directly to those produced by Angrisani et al., where gastric bypass was the most prevalent operation in 2011-2013, with sleeve gastrectomy rapidly increasing and gastric banding decreasing in prevalence.

### Primary surgery in the calendar years 2013-2015: operation

<table>
<thead>
<tr>
<th>Operation</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastric band</td>
<td>2,865</td>
<td>5.5%</td>
</tr>
<tr>
<td>Gastric bypass</td>
<td>25,594</td>
<td>49.4%</td>
</tr>
<tr>
<td>Sleeve gastrectomy</td>
<td>21,079</td>
<td>40.7%</td>
</tr>
<tr>
<td>Bilio-pancreatic diversion</td>
<td>21</td>
<td>0.0%</td>
</tr>
<tr>
<td>Duodenal switch</td>
<td>29</td>
<td>0.1%</td>
</tr>
<tr>
<td>Duodenal switch with sleeve</td>
<td>305</td>
<td>0.6%</td>
</tr>
<tr>
<td>Other</td>
<td>1,927</td>
<td>3.7%</td>
</tr>
<tr>
<td><strong>All</strong></td>
<td>51,820</td>
<td></td>
</tr>
</tbody>
</table>

### Percentage sleeve gastrectomy operations

![Percentage sleeve gastrectomy operations graph]

### Percentage gastric bypass operations

![Percentage gastric bypass operations graph]

---

It is interesting to note that almost all the operations in Peru, Qatar, and Saudi Arabia are sleeve gastrectomies, while in Sweden almost all are gastric bypasses. The reasons for these differences in practice are not known. It could be that countries newer to bariatric surgery have taken up sleeve gastrectomy, while countries with a longer history of bariatric surgery continue with the gastric bypass. All other procedures such as gastric banding, single anastomosis gastric bypass, bili-pancreatic diversion and duodenal switch are represented by the blank spaces between bypass and sleeve.

The white space in between the two sets of bars for each country represents the proportion of other kinds of bariatric surgery, such as gastric banding.
The following chart shows the change in rates of gastric bypass surgery over time for each region. Most of the chart uses data from only those contributors that submitted records across the entire period 2013-2015. However, data from every single contributor are included in the set of bars on the far right-hand side of the graph for the sake of comparison.

Contributors that provided data for only one or two of these calendar years were excluded from the time-series because their inclusion might have disproportionately skewed the results for a particular year, and what we are trying to demonstrate is that there have been some systematic changes in the kind of surgery that is provided for patients with severe and complex obesity.

In the European region, the rate of gastric bypass is very different in the All years group compared to the All contributors group in the chart, both of which represent data from the period 2013-2015. This shows the powerful effect on the calculated percentage caused by one or more contributors that submitted data for only on or two years.

The data for South America appear only in the All contributors section of the chart simply because none of the contributors from this region supplied data in 2013, 2014 and 2015.

It is plain to see that the rate of gastric bypass is going up in Asia, and yet declining in Europe and the Middle East. These changes in practice are a result of clinicians reflecting on information suggesting that one type of operation might be more beneficial for their patients than another kind of bariatric surgery.

There is as yet no clear consensus on the best kind of bariatric surgery.
Operative approach

The rapid expansion of bariatric surgery over the last 25 years has mirrored the development of laparoscopic techniques. The following table shows the prevalence of the laparoscopic approach for the different operations. Almost 99% of all operations were performed laparoscopically, an achievement that could not have been forecast even 20 years ago.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Approach</th>
<th>Laparoscopic</th>
<th>Endoscopic</th>
<th>Lap converted to open</th>
<th>Open</th>
<th>Laparoscopic rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastric band</td>
<td></td>
<td>2,861</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>99.9%</td>
</tr>
<tr>
<td>Gastric bypass</td>
<td></td>
<td>25,368</td>
<td>1</td>
<td>58</td>
<td>167</td>
<td>99.1%</td>
</tr>
<tr>
<td>Sleeve gastrectomy</td>
<td></td>
<td>20,968</td>
<td>3</td>
<td>33</td>
<td>75</td>
<td>99.5%</td>
</tr>
<tr>
<td>All</td>
<td></td>
<td>50,678</td>
<td>527</td>
<td>101</td>
<td>514</td>
<td>97.8%</td>
</tr>
</tbody>
</table>
Outcomes

Post-operative stay

This is the second international comparison of post-operative length-of-stay between the 3 common kinds of operation: gastric banding, gastric bypass and sleeve gastrectomy. As expected, the shortest length-of-stay was for gastric banding, followed by gastric bypass and then sleeve gastrectomy. Over 85% of band patients were discharged within 24 hours of their operation, 75% of bypass patients were discharged by day 2 and nearly 85% of sleeves were discharged by day 3. As is seen in the graphs on the next page, the timing of discharge may very much depend on the local healthcare environment.

After gastric bypass, over 60% of the North American and Middle Eastern patients were discharged by day 1 whereas in South America 70% of patients were discharged on day 3. Asian patients tended to stay longer with 35% being discharged on day 3.

Similar to gastric bypass, over 55% of the North American sleeve gastrectomy patients were discharged on day 1. In contrast most Middle Eastern patients were discharged on days 2 or 3.

Primary surgery in the calendar years 2013-2015: post-operative stay and operation

<table>
<thead>
<tr>
<th>Operation</th>
<th>Gastric band</th>
<th>Gastric bypass</th>
<th>Sleeve gastrectomy</th>
<th>Others</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-operative stay / days</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>&gt;3</td>
</tr>
<tr>
<td>0</td>
<td>377</td>
<td>80</td>
<td>75</td>
<td>378</td>
<td>910</td>
</tr>
<tr>
<td>1</td>
<td>1,469</td>
<td>6,347</td>
<td>2,216</td>
<td>268</td>
<td>10,300</td>
</tr>
<tr>
<td>2</td>
<td>182</td>
<td>6,907</td>
<td>5,225</td>
<td>434</td>
<td>12,748</td>
</tr>
<tr>
<td>3</td>
<td>37</td>
<td>2,428</td>
<td>3,207</td>
<td>245</td>
<td>5,917</td>
</tr>
<tr>
<td>&gt;3</td>
<td>31</td>
<td>1,914</td>
<td>1,631</td>
<td>746</td>
<td>4,322</td>
</tr>
<tr>
<td>Unspecified</td>
<td>769</td>
<td>7,918</td>
<td>8,725</td>
<td>211</td>
<td>17,623</td>
</tr>
<tr>
<td>All</td>
<td>2,865</td>
<td>25,594</td>
<td>21,079</td>
<td>2,282</td>
<td>51,820</td>
</tr>
</tbody>
</table>

Primary surgery: Post-operative stay and operation; calendar years 2013-2015

- Gastric band (n=2,096)
- Gastric bypass (n=17,676)
- Sleeve gastrectomy (n=12,354)
Primary gastric bypass surgery: Post-operative stay and region; calendar years 2013-2015

- N. America (n=1,658)
- S. America (n=488)
- Europe (n=14,832)
- Asia (n=634)
- Middle East (n=64)

Primary sleeve gastrectomy: Post-operative stay and region; calendar years 2013-2015

- N. America (n=930)
- S. America (n=577)
- Europe (n=6,502)
- Asia (n=1,322)
- Middle East (n=3,023)
One-year weight loss

We present weight loss data here as % weight loss and % excess weight loss.

Percentage excess weight loss (%EWL) has been defined as:

$$\frac{\text{initial weight (kg)} - \text{current weight (kg)}}{\text{initial weight (kg)} - [25 \times \text{height}^2 (\text{m}^2)]} \times 100\%$$

It calculates the post-operative weight loss compared to the patient’s initial weight and an arbitrary weight (equivalent to a BMI of 25 kg m$^{-2}$). Numerically, this is exactly the same as percentage excess BMI loss (%EBMIL) when the arbitrary standard is set at a BMI of 25 kg m$^{-2}$. Naturally, if the patient loses so much weight that their BMI drops below the arbitrary value of 25 kg m$^{-2}$ then their percentage excess weight loss will be greater than 100%.

The data are combined for all primary operations.
The graphs here show visually the differences between calculating % excess weight loss and % weight loss. A greater % excess weight loss (%EWL) is shown for a given amount of absolute weight lost if the patient’s initial BMI is lower. Conversely patients with a greater initial BMI lose a greater percentage of their weight.
Effect of surgery on obesity-related disease

In this iteration of the registry we have used the simplest data terms likely to be used by the majority of the contributors. We have not attempted to collect numbers of diabetes medications or HbA1c or treatment for other obesity-related disease. The categoric yes / no definitions still reveal highly significant improvements in disease one year after surgery in over 100,000 patients worldwide, even though the rate of recorded follow up is poor.

Primary surgery in the calendar years 2009-2015: comorbidity before and after surgery

<table>
<thead>
<tr>
<th>Comorbidity prior to surgery</th>
<th>Comorbidity one year after surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Type 2 diabetes</td>
<td>80,323</td>
</tr>
<tr>
<td>Depression</td>
<td>76,113</td>
</tr>
<tr>
<td>Hypertension</td>
<td>67,883</td>
</tr>
<tr>
<td>Musculo-skeletal pain</td>
<td>41,356</td>
</tr>
<tr>
<td>Sleep apnea</td>
<td>84,900</td>
</tr>
<tr>
<td>GERD</td>
<td>36,254</td>
</tr>
</tbody>
</table>

Primary surgery: Comorbidity status before surgery and one year after surgery; calendar years 2009-2015

- Type 2 diabetes
- Depression
- Hypertension
- Musculo-skeletal pain
- Sleep apnea
- GERD

Percentage of patients with the comorbidity
Although the rate of recorded follow up at one year for the type 2 diabetes field is less than 30%, the graphs demonstrate that remission from type 2 diabetes at one year is highly dependent on the amount of weight loss. Before surgery 20.8% patients had type 2 diabetes, at one year the rate was 7.5%. It is expected that international agreement on the dataset will allow the rate of follow-up to improve in future iterations of the global registry.

In this report we have not attempted to analyse improvement in diabetes according to operation type.
## Contributor hospitals

### Brazil
- Fabio Viegas Instituto de Cirurgia do Aparelho Digestivo e Obesidade, Rio de Janeiro

### Canada
- Hôpital du Sacré-Cœur de Montreal

### Chile
- Centro Clínico de la Obesidad, Santiago
  Center for the Treatment of Obesity and Metabolic Diseases, Pontificia Universidad Católica de Chile, Santiago

### China
- The First Affiliated Hospital of Jinan University, Guangzhou

### Colombia
- Clínica la Colina, Bogotá

### Czech Republic
- OB Klinika Mediczech, Prague

### France
- Centre Médico-Chirurgical du Mans, Pôle Santé Sud, Service de Chirurgie Viscérale, Le Mans
  Polyclinique, Lyon Nord-Rillieux

### Germany
- Marienkrankenhaus Kassel Chirurgische Klinik, Kassel
  Adipositaszentrum Nordhessen, Kassel

### Hong Kong
- Prince of Wales Hospital, Shatin
  United Christian Hospital, Kowloon

### India
- **Obesity Surgery Society of India**
  - Apollo Hospital, Kakinada
  - Apollo Hospital, Chennai
  - Apollo Spectra Hospital, Mumbai
  - Asian Bariatrics, Ahmedabad
  - Asian Institute of Gastroenterology, Hyderabad
  - Aster CMI Hospital, Bangalore
  - A V Da Costa Hospital, Goa
  - Care Institute of Medical Sciences, Ahmedabad
  - Columbia-Asia Hospitals, Yeshwanthpura, Bangalore
  - Continental Hospital, Telengana
  - Dhawna Hospital, Panchkula
  - Fortis Hospital, Vasant Kunj, New Delhi
  - Gunasheela Surgical & Maternity Hospital, Bangalore
  - Hindija Healthcare Speciality, Mumbai
  - ILS Hospital, Kolkata
  - Jammu Hospital, Jalandhar
  - Jeewan Mala Hospital, New Delhi
  - Kirloskar Hospital, Hyderabad
  - Kular Hospital, Ludhiana
  - Max Super Speciality Hospital, Saket, New Delhi
  - National Hospital, Mumbai
  - Wockhardt Hospital, Mumbai
  - Zen Hospital, Mumbai
<table>
<thead>
<tr>
<th>Contributors</th>
<th>The Israel National Bariatric Surgery Registry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ireland</td>
<td>Bon Secours Hospital, Cork</td>
</tr>
<tr>
<td>Israel</td>
<td>The Israel National Bariatric Surgery Registry</td>
</tr>
<tr>
<td></td>
<td>Assaf HaRofeh Medical Center, Assaf HaRofeh Hospital</td>
</tr>
<tr>
<td></td>
<td>Assuta Medical Center</td>
</tr>
<tr>
<td></td>
<td>Bnei Zion Hospital</td>
</tr>
<tr>
<td></td>
<td>Elisha Hospital</td>
</tr>
<tr>
<td></td>
<td>Emek Medical Center</td>
</tr>
<tr>
<td></td>
<td>Hadassah Medical Center, Ein Kerem campus</td>
</tr>
<tr>
<td></td>
<td>Hadassah Medical Center, Mount Scopus campus</td>
</tr>
<tr>
<td></td>
<td>Herzliya Medical Center</td>
</tr>
<tr>
<td></td>
<td>Ichilov Hospital, Tel Aviv Sourasky Medical Center</td>
</tr>
<tr>
<td></td>
<td>Kaplan Medical Center</td>
</tr>
<tr>
<td></td>
<td>Laniado Hospital</td>
</tr>
<tr>
<td></td>
<td>Meir Medical Center</td>
</tr>
<tr>
<td></td>
<td>Mount Carmel Hospital</td>
</tr>
<tr>
<td></td>
<td>Rabin Medical Center- Hasharon Hospital</td>
</tr>
<tr>
<td></td>
<td>Rabin Medical Center, Beilinson Hospital</td>
</tr>
<tr>
<td>Italy</td>
<td>Hospital San Giovanni Bosco, Naples</td>
</tr>
<tr>
<td>Jordan</td>
<td>Gastrointestinal Bariatric &amp; Metabolic Center, Jordan Hospital, Amman</td>
</tr>
<tr>
<td>Kingdom of Saudi Arabia</td>
<td>King Saud University Hospital, Riyadh</td>
</tr>
<tr>
<td></td>
<td>New You Medical Center, Riyadh</td>
</tr>
<tr>
<td>Kuwait</td>
<td>Al Amiri Hospital, Kuwait City</td>
</tr>
<tr>
<td>Lithuania</td>
<td>Lithuanian University of Health Sciences Hospital, Kaunas</td>
</tr>
<tr>
<td>Mexico</td>
<td>Instituto Nacional de la Nutrición Salvador Zubirán, Mexico City</td>
</tr>
<tr>
<td></td>
<td>Centro Médico ABC, Mexico City</td>
</tr>
</tbody>
</table>
Netherlands

**Dutch Audit for Treatment of Obesity**

- Albert Schweitzer Ziekenhuis Dordrecht
- Bariatrisch Centrum Zuid West Nederland
- Catharina Ziekenhuis Eindhoven
- Maasstad Ziekenhuis Rotterdam
- Máxima Medisch Centrum Eindhoven / Veldhoven
- MC Zuidzee Leeuwarden
- MC Slotervaart Amsterdam
- Medisch Centrum Leeuwarden
- Nederlandse Obesitas Kliniek (NOK) Heerlen
- Nederlandse Obesitas Kliniek (NOK) West
- Onze Lieve Vrouwe Gasthuis (OLVG) Amsterdam
- Rijnstate Ziekenhuis Arnhem
- Rode Kruis Ziekenhuis Beverwijk
- Sint Franciscus Gasthuis Rotterdam
- St Antonius Ziekenhuis Nieuwegein
- TweeSteden Ziekenhuis Tilburg
- Waterlandziekenhuis Purmerend
- Ziekenhuis Groep Twente (ZGT)
- ZorgSaam Ziekenhuis Zeeuws-Vlaanderen

Panama

- Hospital Punta Pacífica

Peru

- Clinica de dia Avendaño, Lima

Qatar

- Hamad General Hospital, Hamad Medical Corporation, Doha

Russia

**Russian National Bariatric Surgery Registry**

- AVA - Kazan
- Clinic of Endoscopic & Minimal Invasive Surgery, Stavropol State Medical University
- Clinic of Excess Weight and Diabetes, Moscow
- Clinic UGMK Health, Ekaterinburg
- LLC Medical Center, Medeor, Chelyabinsk
- LLC SM Clinic, Kazan
- Non-State Health Care Facility, Central Clinical Hospital N° 2 JSC, Russian Railways Hospital, Moscow
- Non-State Health Care Facility, Clinical Hospital, The Station Krasnodar of JSC, Russian Railways Hospital, Krasnodar
- Non-State Health Care Facility, Clinical Hospital, The Station Mineral Water of JSC, Russian Railways Hospital
- Non-State Health Care Facility, The Station Khabarovsk-1 of JSC, Russian Railways Hospital, Khabarovsk
- Non-State Health Care Facility, The Station Voronezh-1 of JSC, Russian Railways Hospital, Voronezh
- Pavlov First Saint Petersburg State Medical University, St. Petersburg
- Regional Clinical Hospital, Khanty-Mansiysk
- Regional Clinical Hospital N° 2, Krasnodar
- Republic Clinical Hospital of First Aid, Grozny
- Samara Regional Hospital
- State Clinical Hospital, South Regional Medical Center of Federal Medical Biological Agency, Rostov-on-Don
- State Clinical Hospital of First Aid N° 2, Omsk
- State Hospital of First Aid, Ufa
- State Hospital N° 5, Nizhny Novgorod
- State Regional Clinical Hospital, Ryazan
- The Center of Endosurgery and Lithotripsy (CELT), Moscow
- The Federal State Budgetary Institute, The Nikiforov Russian Center of Emergency & Radiation Medicine, St. Petersburg
- Treatment & Rehabilitation Center of The Ministry of Health of the Russian Federation, Moscow
### Contributors

#### Spain

Hospital de Torrevieja, Alicante  
Hospital Clínico San Carlos, Complutense University Medical School, Universidad Complutense de Madrid

#### Sweden

**Scandinavian Obesity Surgery Registry**

<table>
<thead>
<tr>
<th>Hospital/Institution</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aleris Motala</td>
<td>Sweden</td>
</tr>
<tr>
<td>Aleris Skåne</td>
<td>Sweden</td>
</tr>
<tr>
<td>Axcess Medica Smirishamn</td>
<td>Sweden</td>
</tr>
<tr>
<td>Bariatric Center Skåne</td>
<td>Sweden</td>
</tr>
<tr>
<td>Bariatric Center Sophiahemmet</td>
<td>Sweden</td>
</tr>
<tr>
<td>Blekinge Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Borås Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Capio St Göran Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Carlanderka Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Centrum för tittålskirurgi</td>
<td>Sweden</td>
</tr>
<tr>
<td>Danderyd Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Eksjö Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Ersta Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Falun Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Gävle Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Hudiksvall Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Kalmar Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Ljungby Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Lund University Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Lycksele Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Mora Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Norrköping Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Norrtälje Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Nyköping Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Sahlgrenska University Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Skövde Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Sunderbyn Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Sundsvall Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Södersjukhuset Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Södertalje Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Torsby Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Trollhättan Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Uppsala University Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Varberg Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Värnamo Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Västervik Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Västerås Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Västra Frölunda Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Växjö Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Örebro / Lindesberg University Hospital</td>
<td>Sweden</td>
</tr>
<tr>
<td>Österlenkirurgi Simrishamn</td>
<td>Sweden</td>
</tr>
<tr>
<td>Östersund Hospital</td>
<td>Sweden</td>
</tr>
</tbody>
</table>

#### Switzerland

Hôpital du Chablais, Aigle

#### Taiwan

Min Sheng General Hospital, Taoyuan  
Bariatric & Metabolic International Surgery Center E-Da Hospital, Kaohsiung City

#### Turkey

**Turkish National Obesity Database**

<table>
<thead>
<tr>
<th>Hospital/Institution</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Büyük Anadolu Hospital, Samsun</td>
<td>Turkey</td>
</tr>
<tr>
<td>Doruk Yıldırım Hospital, Bursa</td>
<td>Turkey</td>
</tr>
<tr>
<td>Firat University Faculty of Medicine, Elazig</td>
<td>Turkey</td>
</tr>
<tr>
<td>Ibn-i Sina Hospital, Osmaniye</td>
<td>Turkey</td>
</tr>
<tr>
<td>Medical Park Hospital, Samsun</td>
<td>Turkey</td>
</tr>
<tr>
<td>Medilife Beylikduzu Hospital, Istanbul</td>
<td>Turkey</td>
</tr>
<tr>
<td>Metabolic Surgery Clinic, Istanbul</td>
<td>Turkey</td>
</tr>
<tr>
<td>Tekden Hospital, Denizli</td>
<td>Turkey</td>
</tr>
<tr>
<td>Tinaztepe Hospital, Izmir</td>
<td>Turkey</td>
</tr>
</tbody>
</table>

#### United Arab Emirates

Bariatric & Metabolic Institute Abu Dhabi, Sheikh Khalifa Medical City, Abu Dhabi
United Kingdom

The UK National Bariatric Surgery Registry

Ashford Hospital, Middlesex
Ashtead Hospital
Berkshire Independent Hospital, Reading
BMI Albyn Hospital, Aberdeen
BMI Bath Clinic
BMI Chelsfield Park Hospital, Orpington
BMI Mount Alvernia Hospital, Guildford
BMI Sarum Road Hospital, Winchester
BMI The Alexandra Hospital, Manchester
BMI The Clementine Churchill Hospital, Harrow
BMI The Driefontein Spa Hospital
BMI The Hampshire Clinic, Basingstoke
BMI The Harbour Hospital, Dorset
BMI The London Independent Hospital
BMI The Meridien Hospital, Coventry
BMI The Park Hospital, Nottingham
BMI The Princess Margaret Hospital, Windsor
BMI The Priory Hospital, Birmingham
BMI The Ridgeway Hospital, Swindon
BMI The Runnymede Hospital, Chertsey
BMI The Shelburne Hospital, High Wycombe
BMI The South Cheshire Private Hospital, Leighton
BMI Thornbury Hospital, Sheffield
Bradford Royal Infirmary
Castle Hill Hospital, Cottingham
Chelsea & Westminster Hospital, London
Cheltenham General Hospital
Churchill Hospital, Oxford
Circle Bath Hospital
Claremont Hospital, Sheffield
Countess of Chester Hospital
Cromwell Hospital, London
Darlington Memorial Hospital
Derriford Hospital, Plymouth
Dewsbury & District Hospital, West Yorkshire
Dolan Park Hospital, Bromsgrove
Doncaster Royal Infirmary
Duchy Hospital, Truro
Gloucestershire Royal Hospital, Gloucester
Heartlands Hospital, Birmingham
Hexham General Hospital
Holly House Hospital, Essex
Homerton University Hospital, London
Hospital of St John and St Elizabeth, London
Huddersfield Royal Infirmary
King’s College Hospital, London
Lanarkshire University Hospital
Leicester General Hospital
London Bridge Hospital, London
Luton & Dunstable University Hospital
Maidstone Hospital, Kent
Manchester Royal Infirmary
McIndoe Surgical Centre, East Grinstead
Morriston Hospital, Swansea
Musgrove Park Hospital, Taunton
Ninewells Hospital, Dundee
Norfolk & Norwich University Hospital
Northern General Hospital, Sheffield
North Tyneside General Hospital, North Shields
Nuffield Health Bournemouth Hospital
Nuffield Health Brentwood Hospital
Nuffield Health Bristol Hospital
Nuffield Health Cheltenham Hospital
Nuffield Health Derby Hospital
Nuffield Health Glasgow Hospital
Nuffield Health Guildford Hospital
Nuffield Health Leeds Hospital
Nuffield Health Newcastle-upon-Tyne Hospital
Nuffield Health North Staffordshire Hospital
Nuffield Health Plymouth Hospital
Nuffield Health Shrewsbury Hospital
Nuffield Health Taunton Hospital
Nuffield Health The Grovesnor Hospital, Chester
Nuffield Health Warwickshire Hospital
Nuffield Heath The Manor Hospital, Oxford
Nuffield Health Hospital York
Orpington Treatment Centre
Parkside Hospital, London
Poole Hospital, Dorset
Princess Royal Hospital, Telford
Princess Royal University Hospital, Orpington
Queen Alexandra Hospital, Portsmouth
Queen’s Hospital Romford
Ramsay Mount Stuart Hospital, Torquay
Ramsey Winfield Hospital, Gloucestershire
Rivers Hospital, Sawbridgeworth
Royal Berkshire Hospital, Reading
Royal Bournemouth General Hospital
Royal Cornwall Hospital, Truro
Royal Derby Hospital
Royal Infirmary of Edinburgh
Royal Shrewsbury Hospital
Salisbury & District Hospital
Southampton General Hospital
Southmead Hospital, Bristol
Springfield Hospital, Chelmsford
Spire Bushey Hospital, Watford
Spire Dunedin Hospital, Reading
Spire Elland Hospital, West Yorkshire
Spire Fylde Coast Hospital, Blackpool
United Kingdom continued …

Spire Gatwick Park Hospital, Horley
Spire Harpenden Hospital
Spire Healthcare
Spire Hull & East Riding Hospital, Anlaby
Spire Leeds Hospital
Spire Little Aston Hospital, Sutton Coldfield
Spire Manchester Hospital
Spire Murrayfield Hospital, Edinburgh
Spire Murrayfield Hospital Wirral
Spire Norwich Hospital
Spire Parkway Hospital, Solihull
Spire Portsmouth Hospital
Spire Regency Hospital, Macclesfield
Spire Roding Hospital, Redbridge
Spire Southampton Hospital
Spire South Bank Hospital, Worcester
Spire Thames Valley Hospital, Slough
Spire Washington Hospital, Tyne & Wear
Spire Yale Hospital, Wrexham
St Anthony’s Hospital, London
St George’s Hospital, London
St James’s University Hospital, Leeds
St Mary’s Hospital, London

Stobhill Hospital, Glasgow
St Peter’s Hospital, Chertsey
St Richard’s Hospital, Chichester
St Thomas’s Hospital, London
Sunderland Royal Hospital
The James Cook University Hospital, Middlesbrough
The London Clinic
The Princess Grace Hospital, London
The Yorkshire Clinic, Bingley
University College Hospital London
University Hospital Ayr
University Hospital Aintree
University Hospital Coventry
University Hospital Crosshouse, Kilmarnock
University Hospital Lewisham
University Hospital of North Staffordshire
University Hospital of North Tees, Stockton-on-Tees
Walsall Manor Hospital
Wansbeck Hospital
Whittington Hospital, London
Worcestershire Royal Hospital
York Hospital
Yorkshire Surgicentre, Rotherham

United States of America

Fresno Heart & Surgical Hospital, California
### Basic demographic data
All baseline data refer to the condition of the patient at the time of surgery, unless otherwise specified.

<table>
<thead>
<tr>
<th>Unique patient identifier</th>
</tr>
</thead>
</table>

#### Baseline data

##### Basic patient details

<table>
<thead>
<tr>
<th>Date of birth</th>
<th>dd/mm/yyyy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
</tr>
<tr>
<td></td>
<td>Female</td>
</tr>
<tr>
<td></td>
<td>Unknown</td>
</tr>
<tr>
<td>Height</td>
<td>cm</td>
</tr>
<tr>
<td>Weight on entry to the weight-loss program</td>
<td>kg</td>
</tr>
<tr>
<td>Funding category</td>
<td>Publicly funded</td>
</tr>
<tr>
<td></td>
<td>Self-pay</td>
</tr>
<tr>
<td></td>
<td>Private insurer</td>
</tr>
</tbody>
</table>

#### Comorbidities

<table>
<thead>
<tr>
<th>Type 2 diabetes on medication</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes medication type</td>
<td>Oral therapy</td>
<td>Insulin</td>
</tr>
<tr>
<td>Hypertension on medication</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Depression on medication</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Increased risk of DVT or PE</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Musculo-skeletal pain on medication</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Confirmed sleep apnea</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Dyslipidemia on medication</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>GERD</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
## Second IFSO Global Registry Report 2016

**International Federation for the Surgery of Obesity and Metabolic Disorders**

**IFSO Global Registry**

**Baseline section; Page 2; Version 2.2 (1 Nov 2015)**

<table>
<thead>
<tr>
<th>Field</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unique patient identifier</td>
<td></td>
</tr>
<tr>
<td>Date of operation</td>
<td>dd/mm/yyyy</td>
</tr>
<tr>
<td>Surgery</td>
<td></td>
</tr>
<tr>
<td>Date of operation</td>
<td>dd/mm/yyyy</td>
</tr>
<tr>
<td>Has the patient had a prior gastric balloon</td>
<td>No</td>
</tr>
<tr>
<td>Weight at surgery</td>
<td>kg</td>
</tr>
<tr>
<td>Has the patient had bariatric surgery before</td>
<td>No</td>
</tr>
<tr>
<td>Operative approach</td>
<td>Laparoscopic</td>
</tr>
<tr>
<td>Type of operation</td>
<td>Gastric band</td>
</tr>
<tr>
<td>Type of bypass</td>
<td>Roux-en-Y</td>
</tr>
<tr>
<td>Details of other procedure</td>
<td>Gastric plication</td>
</tr>
<tr>
<td></td>
<td>Vertical banded gastroplasty</td>
</tr>
<tr>
<td>Outcomes</td>
<td></td>
</tr>
<tr>
<td>Leak within 30 days of surgery</td>
<td>No</td>
</tr>
<tr>
<td>Bleeding within 30 days of surgery</td>
<td>No</td>
</tr>
<tr>
<td>Obstruction within 30 days of surgery</td>
<td>No</td>
</tr>
<tr>
<td>Re-operation for complications within 30 days of surgery</td>
<td>No</td>
</tr>
<tr>
<td>Patient status at discharge</td>
<td>Alive</td>
</tr>
<tr>
<td>Date of discharge or death</td>
<td>dd/mm/yyyy</td>
</tr>
</tbody>
</table>
### Follow up section

**Unique patient identifier**  

**Date of follow up**  

<table>
<thead>
<tr>
<th>Follow up</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight at follow up</td>
<td>kg</td>
</tr>
<tr>
<td>Type 2 diabetes on medication</td>
<td></td>
</tr>
<tr>
<td>Diabetes medication type</td>
<td></td>
</tr>
<tr>
<td>Hypertension on medication</td>
<td></td>
</tr>
<tr>
<td>Depression on medication</td>
<td></td>
</tr>
<tr>
<td>Musculo-skeletal pain on medication</td>
<td></td>
</tr>
<tr>
<td>Confirmed sleep apnea</td>
<td></td>
</tr>
<tr>
<td>Dyslipidemia on medication</td>
<td></td>
</tr>
<tr>
<td>GERD</td>
<td></td>
</tr>
<tr>
<td>Clinical evidence of malnutrition</td>
<td></td>
</tr>
<tr>
<td>Patient status</td>
<td></td>
</tr>
</tbody>
</table>

- **Type 2 diabetes on medication**: No, Yes  
- **Diabetes medication type**: Oral therapy, Insulin  
- **Hypertension on medication**: No, Yes  
- **Depression on medication**: No, Yes  
- **Musculo-skeletal pain on medication**: No, Yes  
- **Confirmed sleep apnea**: No, Yes  
- **Dyslipidemia on medication**: No, Yes  
- **GERD**: No, Yes  
- **Clinical evidence of malnutrition**: No, Yes  
- **Patient status**: Alive, Deceased
The Second IFSO Global Registry Report 2016

This is the second international analysis of outcomes from bariatric (obesity) and metabolic surgery, gathered under the auspices of IFSO (the International Federation for the Surgery of Obesity and Metabolic Disorders).

The Second IFSO Global Registry Report 2016 is the beginning of a process of continuous data collection in the field of bariatric surgery, the surgery of obesity, from all over the world. In the future more and more national data registries will be established and included in the global database. Independent from national characteristics, the fundamental effect of bariatric surgery on weight and weight-related diseases can be demonstrated. Bariatric surgery is the most powerful treatment for the chronic disease of obesity. Therefore, this document should be read widely by decision makers in health systems worldwide. It gives readers, including policy-makers, politicians, public health specialists and journalists, a vital snapshot of obesity surgery treatment internationally and progress towards health and well-being for all.

Kelvin Higa

The Second IFSO Global Registry Report 2016 is the beginning of a process of continuous data collection in the field of bariatric surgery, the surgery of obesity, from all over the world. In the future more and more national data registries will be established and included in the global database. Independent from national characteristics, the fundamental effect of bariatric surgery on weight and weight-related diseases can be demonstrated. Bariatric surgery is the most powerful treatment for the chronic disease of obesity. Therefore, this document should be read widely by decision makers in health systems worldwide. It gives readers, including policy-makers, politicians, public health specialists and journalists, a vital snapshot of obesity surgery treatment internationally and progress towards health and well-being for all.

Rudolf Weiner

The (WHO) data indicate a global, inexorable increase in the number of people with obesity and severe obesity, especially in the female population, between 1975 and 2014. Bariatric-metabolic surgery is one of the few highly effective tools to manage this growing burden of chronic disease. It is important that we understand the delivery of bariatric-metabolic surgery on a global basis and the IFSO international registry provides a vital component in monitoring the response to this epidemic.

John Dixon