National Audit of Hospital Mortality Annual Report 2017

AUTHOR(S)

Brian Creedon, Simon Jones, Deirdre Murphy, Howard Johnson, Jan Sorensen, Alan Egan, Deirdre Burke, Aisling Connolly, Marina Cronin, Fionnola Kelly, The National Audit of Hospital Mortality Governance Committee, The National Office of Clinical Audit (NOCA)

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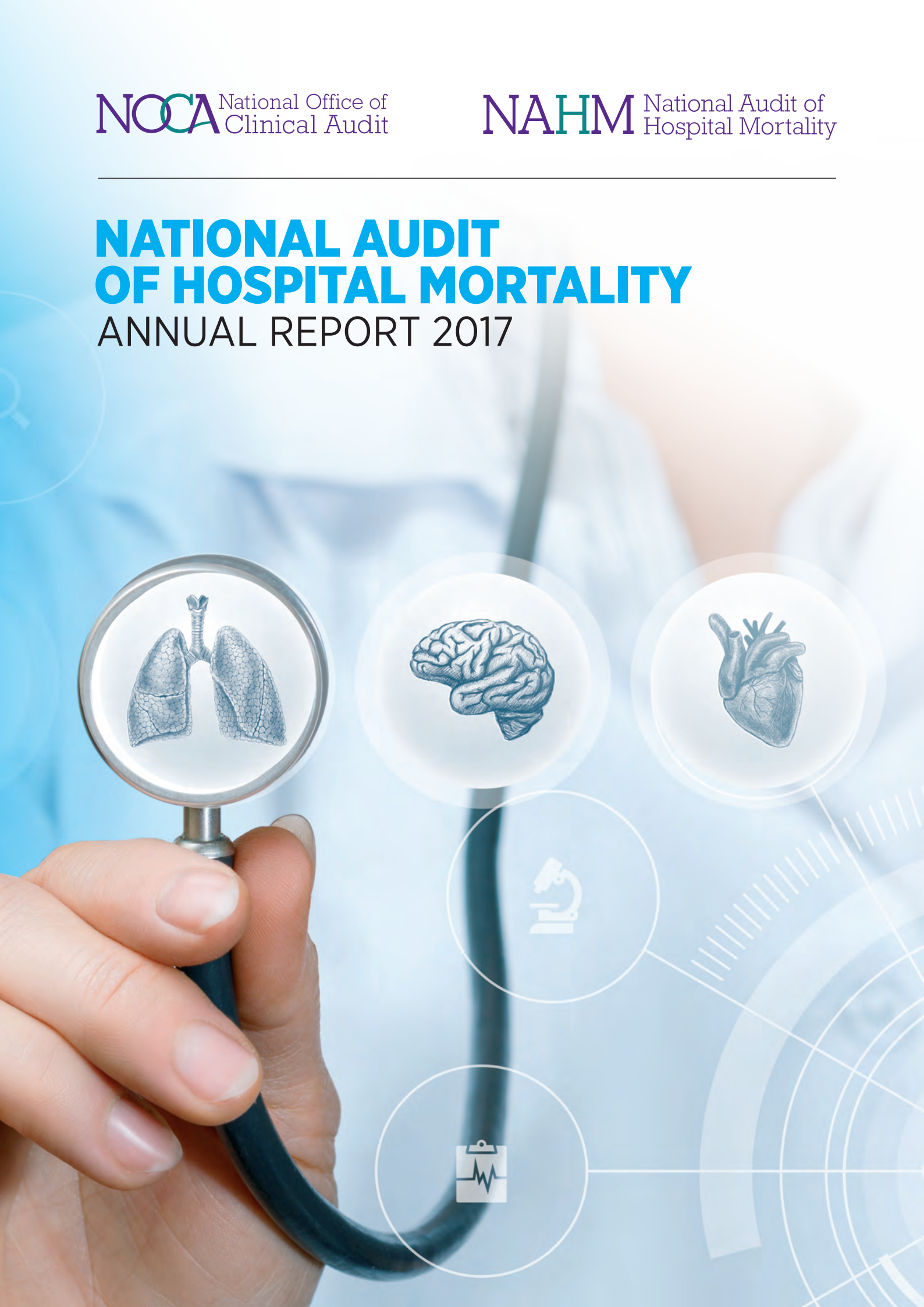
NCA National Office of Clinical Audit

NAHM National Audit of Hospital Mortality

NATIONAL AUDIT OF HOSPITAL MORTALITY

ANNUAL REPORT 2017



PREPARED BY THE FOLLOWING WITH ASSISTANCE FROM MEMBERS OF THE NAHM GOVERNANCE COMMITTEE

Dr Brian Creedon
Chair, NAHM Governance Committee
Royal College of Physicians of Ireland

Prof Simon Jones
International Expert
New York University Medical School

Deirdre Murphy
Head of HIPE & NPRS
Healthcare Pricing Office

Dr Howard Johnson
Clinical Lead
Health Intelligence, Strategic Planning and Transformation, HSE

Prof Jan Sorenson
Healthcare Outcomes Research Centre
Royal College of Surgeons in Ireland

Alan Egan
Public and Patient Interest Representative
NAHM Governance Committee

Deirdre Burke
National Audit of Hospital Mortality Manager
National Office of Clinical Audit

Aisling Connolly
Communications and Events Lead
National Office of Clinical Audit

Marina Cronin
Head of Quality and Development
National Office of Clinical Audit

Fionnola Kelly
Biostatistician
National Office of Clinical Audit

NATIONAL OFFICE OF CLINICAL AUDIT (NOCA)

NOCA was established in 2012 to create sustainable clinical audit programmes at national level. NOCA is funded by the Health Service Executive Quality Improvement Division and operationally supported by the Royal College of Surgeons in Ireland.

The National Clinical Effectiveness Committee (NCEC, 2015) define national clinical audit as "a cyclical process that aims to improve patient care and outcomes by systematic, structured review and evaluation of clinical care against explicit clinical standards on a national basis".

NOCA supports hospitals to learn from their audit cycles.

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This work uses data provided by patients and collected by their healthcare providers as part of their care.

The NAHM Governance Committee wish to acknowledge the HSE National Clinical Care Programmes for their guidance and support in preparation of this third annual report. In particular, we wish to mention the following;

Dr Rónán Collins and Ms Joan McCormack from the National Clinical Programme in Stroke

Prof Tim McDonnell, Dr Máire O'Connor and Ms Linda Kearns from the National Clinical Programme for Chronic Obstructive Pulmonary Disease

Prof Karen Ryan from the National Clinical Programme for Palliative Care

The National Clinical Programme for Acute Coronary Syndrome

The National Clinical Programme for Heart Failure

The National Acute Medicine Programme

Health Intelligence, Strategic Planning and Transformation, HSE, supports the quest for better health for patients, their families and the public by exploiting the quality assurance/improvement, health mapping and research potential of available data. The HIU leads the development of the National Quality Assurance information System (NQAIS) suite of tools in partnership with OpenApp, the National Clinical Programmes and other stakeholders. NQAIS NAHM focuses on in-hospital mortality patterns.

The Quality Improvement Division (QID) was established to support the development of a culture that ensures improvement of quality of care is at the heart of all services that the HSE delivers. HSE QID work in partnership with patients, families and all who work in the health system to innovate and improve the quality and safety of our care.

The Healthcare Pricing Office (HPO) manage the Hospital In-patient Enquiry Scheme (HIPE) which collects information on hospital day cases and inpatients in Ireland. The HPO provide HIPE data to Health Intelligence, Strategic Planning and Transformation, HSE, for the generation of mortality patterns in the NQAIS NAHM tool.

ACKNOWLEDGING SIGNIFICANT CONTRIBUTIONS FROM THE FOLLOWING:

For more information about this report, contact: National Office of Clinical Audit, 2nd Floor, Ardilaun House, 111 St Stephens Green, Dublin 2, D02 VN51

Tel: + (353) 1 4028577
Email: nahm@noca.ie

DESIGNED BY SWERVE

NCA National Office of Clinical Audit

National Audit of Hospital Mortality

ANNUAL REPORT 2017

NOCA National Office of Clinical Audit

Dr Brian Creedon
Chair
National Audit of Hospital Mortality Governance Committee
National Office of Clinical Audit
2nd Floor, Ardilaun House
111 St. Stephen's Green
Dublin 2

12th November 2018

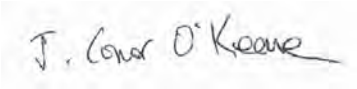
Dear Dr Creedon,

I wish to acknowledge receipt of the National Audit of Hospital Mortality Annual Report 2017. Following your presentation to the NOCA Governance Board on 8th November 2018 and feedback from our membership, we are delighted to endorse this report.

On behalf of the NOCA Governance Board, I wish to congratulate you and your committee on an excellent report which gives assurance to patients that mortality is being carefully monitored in Irish hospitals. It is particularly reassuring that no clinical issues were identified in 2017.

Please accept this as formal endorsement from the NOCA Governance Board.

Yours sincerely,



Professor Conor O' Keane FFPath FRCPI
Chair
National Office of Clinical Audit Governance Board

National Office of Clinical Audit
2nd Floor
Ardilaun House, Block B
111 St Stephen's Green
Dublin 2, D02 VN51
Tel: + (353) 1 402 8577
Email: auditinfo@noca.ie

FOREWORD

Healthcare improvement is enhanced by patient and public involvement. It is widely acknowledged that patients provide a unique perspective, and their involvement can be a powerful driver of improvements in healthcare. Patient and public involvement in Irish hospitals, along with clinical effectiveness processes, have heralded the advent of service user advocacy in healthcare in Ireland. Since its inception, the National Office of Clinical Audit (NOCA) has recognised that collaboration with patient and public interest representatives and healthcare professionals is essential to the success of clinical audit and quality improvement in healthcare.

ALAN EGAN

As healthcare professionals and patient and public interest representatives, we share the same objective and are committed to continuous improvement in patient care, and to improving patient safety and outcomes. Transparency is a key factor in achieving this aim and is critical to system learning and improvement. The proposition of blind trust in healthcare is no longer acceptable. Through transparency, patients are empowered, and trust between healthcare providers and patients is fostered to the benefit of all.

IRYNA POKHILO

Very often, however, it is healthcare professionals who use publicly available data to compare performance and drive improvement through peer review. Any attempt to introduce transparency will only be sustainable if those healthcare professionals engaged in clinical care understand the benefits of the effort. It needs to be fully supported by healthcare leaders, policy-makers and the public at large. This is especially true where there is variation in the results; hence the importance of this annual National Audit of Hospital Mortality (NAHM) report.

Since it was first established in 2015 and began reporting at hospital level in 2016, NOCA and the participating hospitals have adopted transparency in order to promote improved data quality and patient outcomes using NAHM. The first NAHM report focused on data analysis in an effort to improve data quality. The current report continues to place an emphasis on these areas. Hospitals have shared, and continue to share, their data and experiences of learning and improving from this audit. Three years later, we now see demonstrable progress towards greater transparency.

DR BRIAN CREEDON

Through the annual NAHM report and the data shared in it, we have shown that shining a light on these data can illuminate a path to the improvement of healthcare and patient outcomes.

Alan Egan
Public and Patient
Interest Representative
NAHM Governance Committee

Iryna Pokhilo
Public and Patient
Interest Representative
NOCA Governance Board

Dr Brian Creedon
Clinical Lead and Chair,
NAHM Governance
Committee

Message from Chair, NAHM Governance Committee

DR KATE MCGARRY

NOCA and the NAHM Governance Committee would like to acknowledge our friend and long-standing member of the committee, Dr Kathleen (Kate) McGarry, who sadly died in January 2018.

Dr McGarry was a consultant in general internal medicine with a special interest in non-invasive cardiology. She was a consultant in Our Lady's Hospital, Navan from 1983 until she retired in 2014. She was a member of various Boards and Committees and was President of the Board of the Irish Heart Foundation from September 2015 until her death.

She was a very active and consistent member of the NAHM Governance Committee since its inaugural meeting in March 2015. She never missed a meeting and always contributed extensively to discussions and decisions.

Kate is sadly missed. Her enthusiasm and interest in the work we do was always evident.

Brian Creedon
Chair
NAHM Governance Committee

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EXECUTIVE SUMMARY

This is the third *National Audit of Hospital Mortality Annual Report*. It provides mortality information across six key diagnoses: acute myocardial infarction (heart attack), heart failure, ischaemic stroke, haemorrhagic stroke, chronic obstructive pulmonary disease, and pneumonia. These diagnoses were chosen based on clinical and methodological selection criteria in order to ensure a focus on quality, safety and improvement in acute hospital care; hospitals can also view all diagnoses locally via the National Quality Assurance Improvement System, National Audit of Hospital Mortality (NQAIS NAHM) web-based tool. The purpose of this report is to provide patients, families, the public and the wider health system with details of national hospital mortality, and to assure them that hospitals are continually monitoring patient mortality locally. This report outlines how the audit is used by hospitals and how the National Office of Clinical Audit (NOCA) engages with hospitals.

NQAIS NAHM displays in-hospital mortality patterns and standardised mortality ratios (SMRs) in a national context on a web-based tool where hospitals have an ongoing view of their mortality data and can produce local reports. The SMR is based on the principal diagnosis (the primary reason a patient is admitted to hospital). The source of data for NQAIS NAHM is the Hospital In-Patient Enquiry Scheme (HIPE), which is a health information system designed to collect clinical and administrative data on patient discharges from acute hospitals in Ireland. To ensure that like is compared with like across the diversity of hospitals, potentially confounding factors (i.e. factors that may directly influence the outcome) are accounted for in the analysis – for example, patient age and the presence of other serious illnesses. SMRs do not enable hospitals to compare outcomes against one another, but they do enable comparison against a national average.

Data quality continues to be a high priority for NAHM. NAHM highlights the effects of accurate HIPE coding in a new way that results in a focus on chart documentation in medical records, which in turn will result in more accurate hospital SMRs. Recommendations have been made relating to consistency and accuracy in terminology contained in chart documentation.

Chapter 5 presents information relating to the depth of coding and the use and application of the palliative care code. Data for these two areas are presented for 2017, and NAHM will continue to monitor trends in these areas in future reports.

In-hospital mortality rates for the six diagnoses contained in this report are lower than they were 10 years ago. In 2017, all hospitals had an SMR within the expected range for five of the diagnoses included in this report. During 2017, St James's Hospital was outside of expected ranges for acute myocardial infarction (AMI). St James's Hospital's clinical and quality team, with support from the Healthcare Pricing Office (HPO), carried out a detailed review of source data and coding which resulted in learnings on the importance of data quality and the local collaboration between clinicians and coders, and which highlighted the need for guidance on sequencing of coding for AMI and coronary artery disease (CAD). Highlighting this latter aspect, with its potential national implications, has led to engagement with the HPO to seek a resolution. St James's Hospital put a plan of action in place and the SMR for AMI at year-end in the closed HIPE file for 2017 is within expected ranges. A summary of the review is included in Chapter 6.

The NQAIS NAHM web-based tool has been updated and enhanced during 2018. The appearance of the display is aligned to other NQAIS tools, which will make it more intuitive for users. The new display includes a grid page showing changes in SMR since the last data update, a summary page showing high-level values and cumulative summary (CuSum) signals over three different time periods, a bookmark feature, a 'look back' function, and an interactive explorer. These additions will assist users in accessing and analysing NAHM mortality data. Training for users on the revamped NQAIS NAHM is conducted by NOCA.

HIGHLIGHTS FROM THIS REPORT

- **All hospitals had an SMR within expected ranges for the time period January to December 2017 for the six key diagnoses included in this report. This report presents data for 32 hospitals which meet criteria for inclusion in the report.**
- **Good-quality data and the provision of good information contribute to well-informed decision-making. Analysis shows some evidence of variation in coded data used for NAHM. In fulfilment of NAHM's objective to understand and improve hospital mortality data, NOCA continues to monitor trends and patterns.**
- **Shared learnings from hospitals are once again highlighted in this report. St James's Hospital had a statistical outlier for AMI during 2017. The hospital used the experience to make real changes to its processes, which have resulted in improvements to the quality of its AMI data. A summary of the hospital's review is included in this report. Additionally, two hospitals (Mercy University Hospital and University Hospital Waterford) share how they prospectively use NAHM to support local quality improvement processes.**
- **NOCA collaborates with the Health Intelligence Unit (HIU), Strategic Planning and Transformation in the Health Service Executive (HSE), and with the Office of the Chief Information Officer, HSE (OoCIO), in order to develop and enhance the NQAIS NAHM web-based tool under the governance of the NAHM Governance Committee.**
- **Work carried out by the NAHM Analysis and Display Scientific Team shows that 20% of all admitted patients with a respiratory condition in 2017 had acute lower respiratory infection (unspecified) documented as their principal diagnosis. This finding has resulted in two broad-ranging recommendations: the first is aimed at clinicians to improve the accuracy of documentation, and the second is aimed at NAHM to improve its web-based tool.**

KEY RECOMMENDATIONS

IMPROVING DATA QUALITY

- Clinicians and clinical coders in hospitals are encouraged to cooperate and work together to create clear and complete medical record information and also to validate HIPE coding in order to ensure accuracy between coding classifications and clinical care. This can take place through formal specialty meetings, attendance by clinical coders at clinical meetings, etc.
- Hospital management, through its governance structures such as the Quality and Safety Committees, should actively ensure and, where appropriate, lead and support improvement in data quality.
- Clinicians need to fully and accurately complete discharge summaries (Health Information and Quality Authority, 2012). These should be completed for all patients who are discharged from hospital, including those who die in hospital. Where discharge summaries are used to support coding, they should be complete and consistent with source documentation, and they should contain a definitive diagnosis (using consistent terminology) and all relevant comorbidities.
- Hospitals should review cases with a principal diagnosis of acute lower respiratory infection (unspecified) in order to ensure that this is an accurate diagnosis. Clinicians should use consistent and specific terminology when documenting respiratory diagnoses.

IMPROVING THE NQAIS NAHM WEB-BASED TOOL

- The possibility of expanding the review of heart failure in order to enable broader benchmarking should be explored by the HSE National Clinical Programme for Heart Failure, working with the NAHM Governance Committee.
- The 'acute bronchitis' Clinical Classifications Software (CCS) group in NAHM should be renamed 'acute lower respiratory infection (unspecified)' in order to more accurately reflect the majority of cases it contains.

USING NQAIS NAHM

- Hospitals should continue to use the NQAIS NAHM web-based tool to monitor and review their mortality patterns as part of routine quality improvements and learn from their findings.

CHAPTER 1
INTRODUCTION

CHAPTER 1

INTRODUCTION

THIS IS THE THIRD NATIONAL AUDIT OF HOSPITAL MORTALITY ANNUAL REPORT.

Internationally, there continues to be a focus on the quality of care provided to patients while in hospital. Measuring the levels and standard of this care accurately is challenging, as no single indicator can show the full extent of a hospital's quality of care. There are various quality indicators available – for example, patient experience, safety incident reports, and local hospital audits – which support the overall picture of quality of care in a hospital. In-hospital mortality is one quality indicator that can be accurately measured. However, hospital mortality should not be interpreted in isolation as the sole determinant of a hospital's quality of care; it should be considered in conjunction with other quality indicators, such as those mentioned above.

Standardised mortality ratios (SMRs) are a widely used metric internationally. However, due to differences in inclusion criteria and methodology, direct international comparison is not possible. SMRs are a warning signal to a hospital to indicate whether it is above or below the national average for a particular diagnosis, and to identify where further review is warranted. It is only after such a review that a hospital can fully understand the warning signal and take appropriate action.

NATIONAL QUALITY ASSURANCE IMPROVEMENT SYSTEM, NATIONAL AUDIT OF HOSPITAL MORTALITY

Data are extracted from the Hospital In-Patient Enquiry Scheme (HIPE) and are uploaded to the National Quality Assurance Improvement System, National Audit of Hospital Mortality (NQAIS NAHM) web-based tool. This allows individual hospitals to access their mortality data at hospital, diagnostic group, and individual diagnosis level. This analysis of hospital mortality is calculated using each patient's unique profile, which considers the following variables:

- Age
- Gender
- Pre-existing illness (Charlson Comorbidity Index (CCI))
- Previous emergency admissions in last 12 months
- Indicator of deprivation
- In-hospital palliative care treatment
- Source of admission (e.g. home, nursing home)
- Type of admission (e.g. elective, emergency).

If a hospital's actual mortality level for a diagnosis is within the expected range, it means that the number of patients who died was within the expected range, based on the patient profile. If a hospital's actual mortality level for a diagnosis is outside the expected range, it means that more patients died than was expected, and a review should take place. This is an appropriate way of looking at mortality data, as it reflects the fact that each patient is unique. For example, patients' clinical conditions vary, while patients may also respond differently to treatment such as surgery or medications.

Individual hospitals or hospital groups can view all diagnoses for a full calendar year, or for the previous 12-month rolling period. Data are updated to the tool every quarter, three months in arrears. New users are authorised by their General Manager or CEO and receive training on interpreting the data and SMRs.

Pre-prepared reports are generated with each update of data in NAHM; these are available for all diagnoses or a specific CCS group. An evaluation of the use of NAHM in hospitals was carried out in 2017; this showed that in 89% of responses, NAHM data were presented at Hospital Quality and Safety Committee level (National Office of Clinical Audit, 2017).

The NQAIS NAHM web-based tool has continued to be important for hospitals as part of the quality improvement process. In Chapter 5: Data quality for NAHM, information is presented on the depth of coding in patient charts and the use of palliative care codes. Enhancements to improve presentation and display options have been developed and applied to the NQAIS NAHM web-based tool. These changes are explained fully in Chapter 8: Building on progress.

AIMS OF NAHM

The aims of NAHM are to:
- Understand and improve the quality of hospital-based mortality data
- Promote reflection on the quality of overall patient care
- Identify areas for improvement.

WHAT THIS REPORT DOES

The purpose of this report is to publish mortality data for Irish hospitals. NOCA continues to support transparency in mortality reporting and publishes hospital-identifiable information for six key diagnoses from NAHM. This transparency should assure patients, their families and the wider health system that hospital mortality is being monitored continuously. It is hoped that this report is presented in a clear and understandable way. A summary report with visual statistics is published separately and is available for download from the NOCA website, www.noca.ie.

Analyses of hospital mortality for the following diagnoses are presented in this report:
- Acute myocardial infarction (AMI)
- Heart failure
- Ischaemic stroke
- Haemorrhagic stroke
- Chronic obstructive pulmonary disease (COPD)
- Pneumonia.

This report presents the methodology used to calculate the SMR for Irish hospitals.

WHAT THIS REPORT CANNOT DO

Comparison to other hospitals is not possible, as no two hospitals will have the same patient profile. Some hospitals will have greater numbers of patients with severe conditions; for example, hospitals such as specialist referral centres may only admit patients with more complicated conditions. Hospitals can view their own data in relation to a national average. This report cannot and should not be used to produce league tables or to compare hospitals.

This report cannot be used to compare hospitals.

NAHM IN ACUTE HOSPITALS

NOTE: Dublin hospitals have been displayed collectively by hospital group

- SAOLTA UNIVERSITY HEALTH CARE GROUP
- RCSI HOSPITALS
- IRELAND EAST HOSPITAL GROUP
- DUBLIN MIDLANDS HOSPITAL GROUP
- UL HOSPITAL GROUP
- CHILDREN'S HOSPITAL GROUP
- SOUTH/SOUTH WEST HOSPITAL GROUP

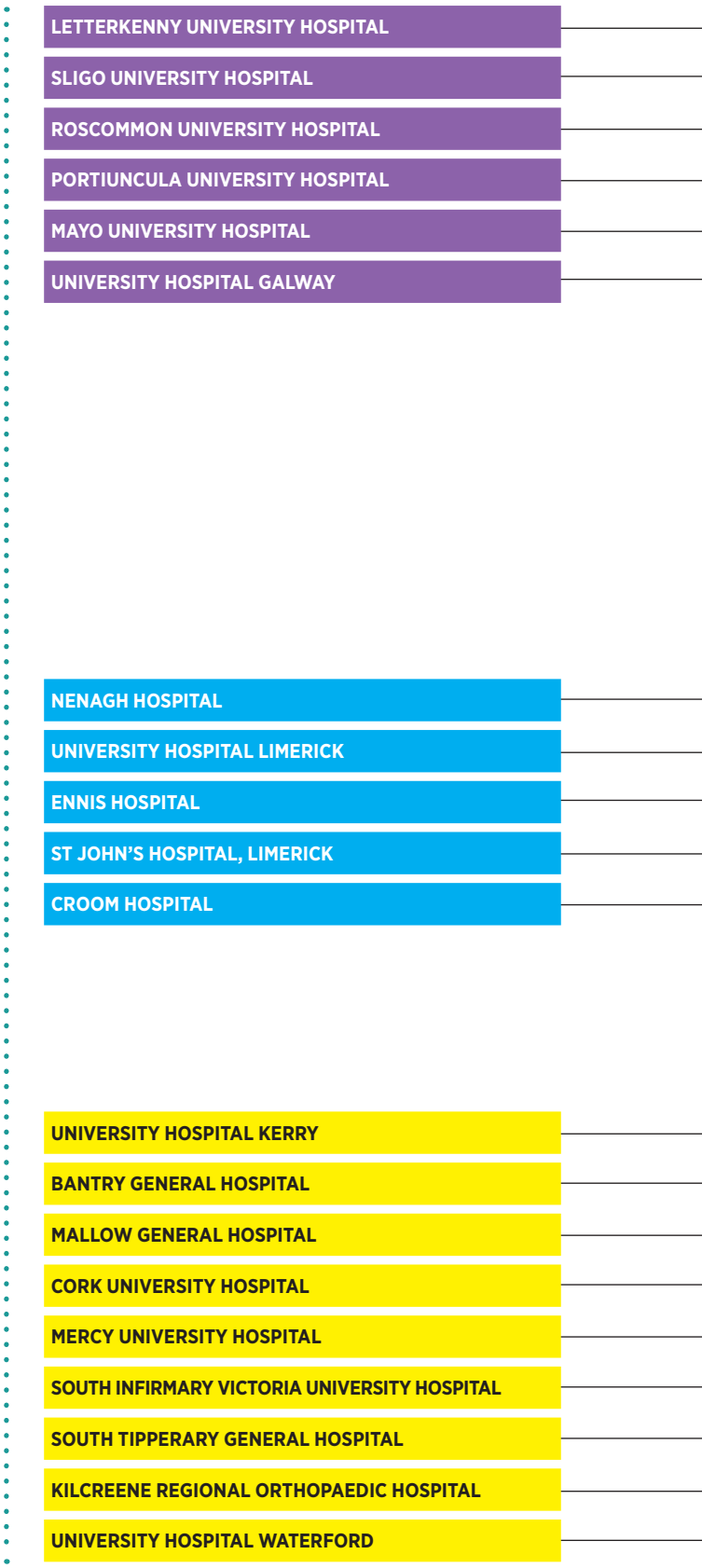
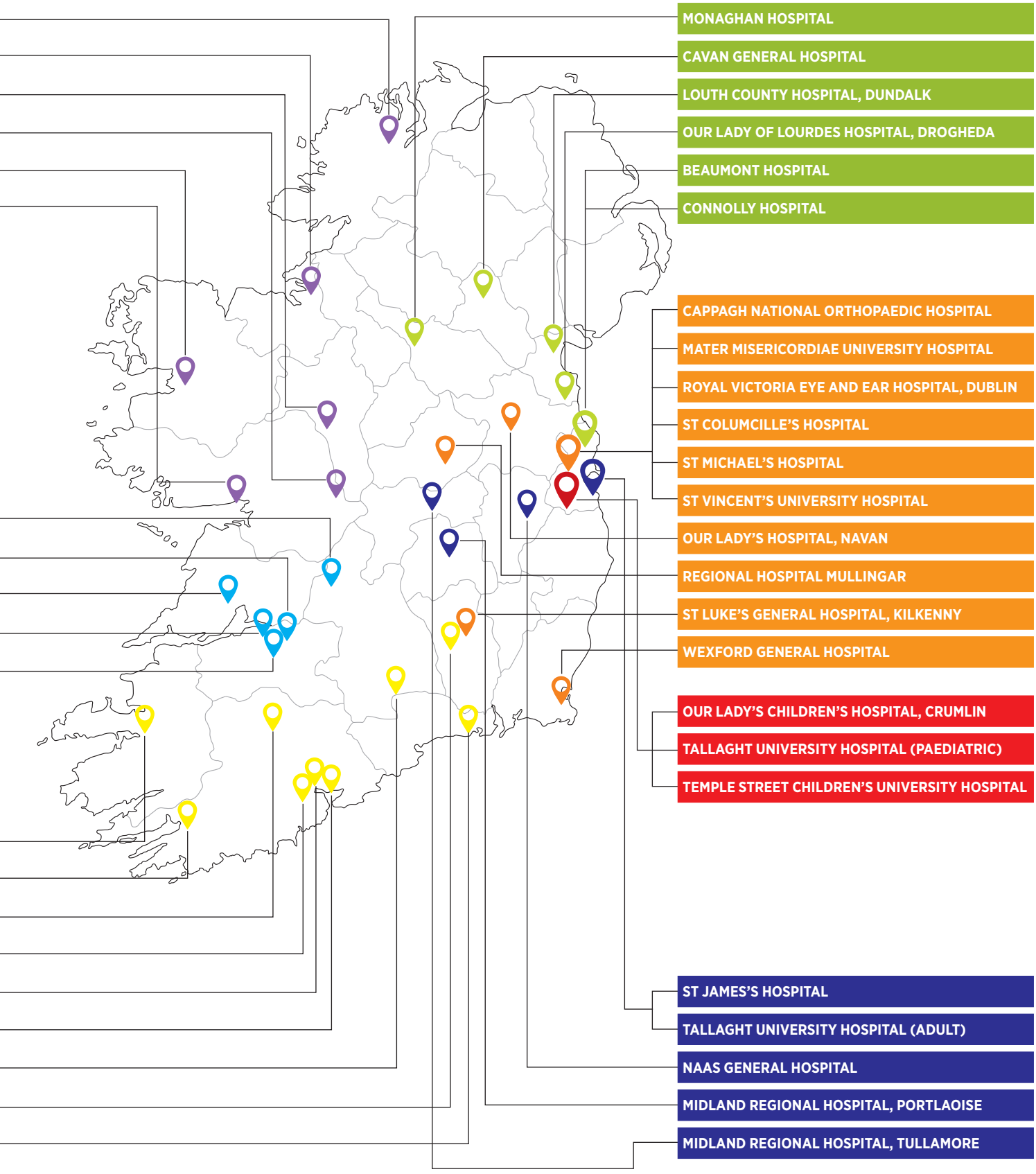
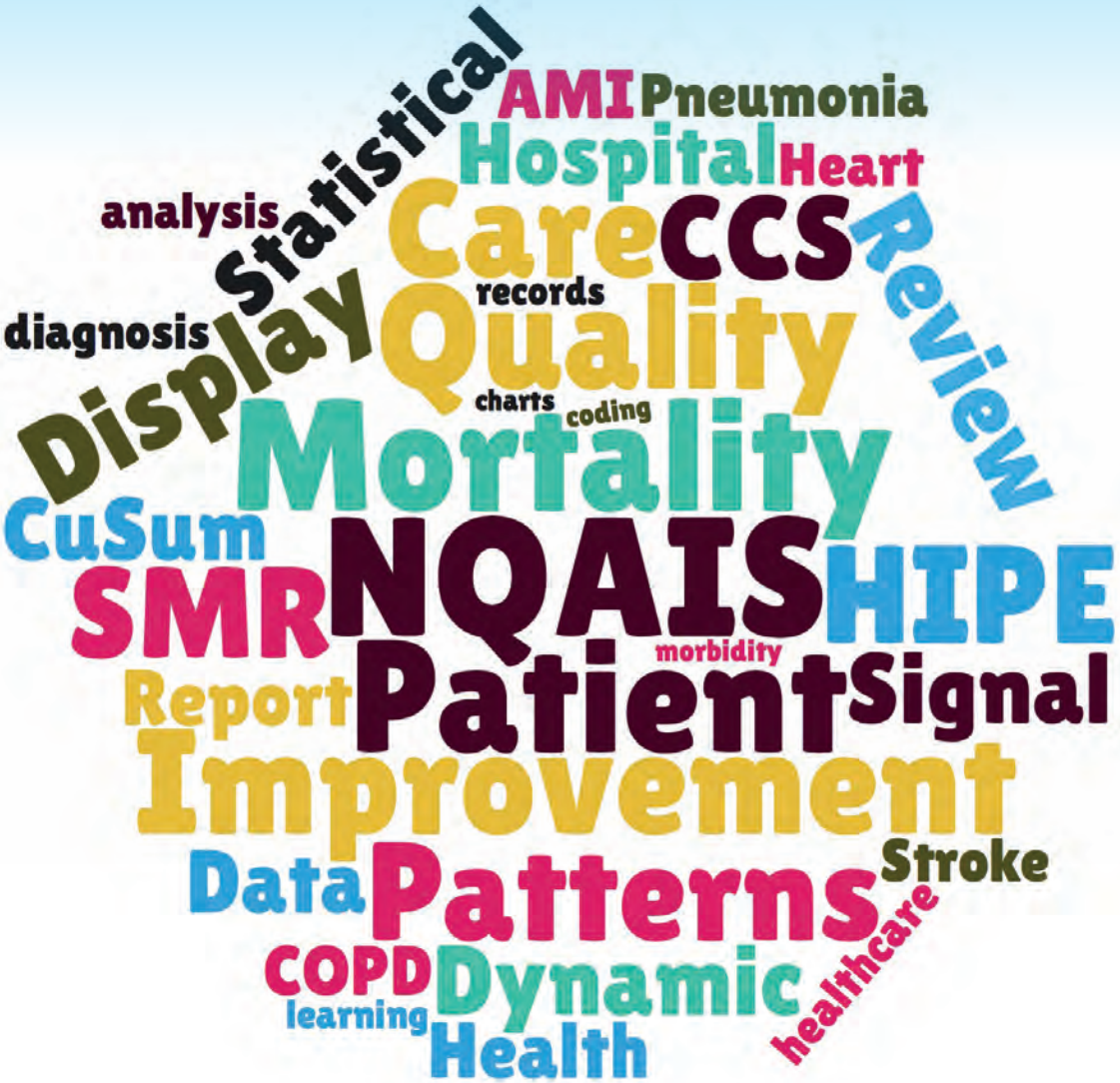


FIGURE 1.1: NAHM IN HOSPITALS


MONAGHAN HOSPITAL
CAVAN GENERAL HOSPITAL
LOUTH COUNTY HOSPITAL, DUNDALK
OUR LADY OF LOURDES HOSPITAL, DROGHEDA
BEAUMONT HOSPITAL
CONNOLLY HOSPITAL
CAPPAGH NATIONAL ORTHOPAEDIC HOSPITAL
MATER MISERICORDIAE UNIVERSITY HOSPITAL
ROYAL VICTORIA EYE AND EAR HOSPITAL, DUBLIN
ST COLUMCILLE'S HOSPITAL
ST MICHAEL'S HOSPITAL
ST VINCENT'S UNIVERSITY HOSPITAL
OUR LADY'S HOSPITAL, NAVAN
REGIONAL HOSPITAL MULLINGAR
ST LUKE'S GENERAL HOSPITAL, KILKENNY
WEXFORD GENERAL HOSPITAL
OUR LADY'S CHILDREN'S HOSPITAL, CRUMLIN
TALLAGHT UNIVERSITY HOSPITAL (PAEDIATRIC)
TEMPLE STREET CHILDREN'S UNIVERSITY HOSPITAL
ST JAMES'S HOSPITAL
TALLAGHT UNIVERSITY HOSPITAL (ADULT)
NAAS GENERAL HOSPITAL
MIDLAND REGIONAL HOSPITAL, PORTLAOISE
MIDLAND REGIONAL HOSPITAL, TULLAMORE

CHAPTER 2
DEVELOPMENT OF NQAIS NAHM



CHAPTER 2

DEVELOPMENT OF NQAIS NAHM

Internationally, several broadly similar and evolving methods, such as the SMR, are used to explore hospital mortality patterns and support the process of healthcare improvement. Following an analysis by the Department of Health in 2014, and its publication of hospital mortality in 2015 (Department of Health, 2015), the NQAIS NAHM web-based tool, which was developed to provide a systematic approach to enable hospitals to review their mortality patterns in detail, was deployed to hospitals.

The NQAIS NAHM web-based tool was developed through a partnership between the Health Intelligence Unit (HIU) in the Health Service Executive (HSE) and OpenApp, with support from Professor Simon Jones (Professor in Population Health, New York University), and with the assistance of Specialist Registrars in Public Health Medicine attached to the HIU (Fitzpatrick, 2014; Robinson, 2016), the HSE Quality Improvement Division (QID), and NOCA. The purpose of NQAIS NAHM is to display individual hospital mortality patterns in a national context and to identify potential learning opportunities that would support clinicians, clinical directors and hospital managers with an evidence base in their ongoing pursuit of excellence in healthcare delivery.

Hospital mortality patterns are generated internationally by the use of routinely collected clinical and administrative data on patients discharged from hospital. In Ireland, these data are collected by the HIPE system, which is overseen by the Healthcare Pricing Office (HPO) on behalf of the HSE.

NQAIS NAHM focuses on the principal diagnosis (the primary reason the patient is admitted to hospital). The diagnosis is categorised into one of approximately 290 clinically meaningful groups, based on the Clinical Classifications Software (CCS) developed by the Healthcare Cost and Utilization Project (HCUP) of the Agency for Healthcare Research and Quality (AHRQ) in Washington, DC. An updated version, CCS-IM-2017, developed by the HIU with advice from the HCUP, is now available across most NQAIS applications.

HIPE data and all of the potential outcome variables are entered into a multiple regression model which calculates the relative impact of each variable on probability of the final outcome – in this case, death. To ensure that like is compared with like across the diversity of hospitals, potentially confounding factors are adjusted for in the model, including patient age; the presence of certain comorbidities based on the CCI (e.g. diabetes, dementia, COPD); admission type (emergency or non-emergency); the number of emergency admissions within the preceding 12 months; admission source (home, nursing home, or other hospital); receipt or otherwise of palliative care; and an indicator of deprivation (medical card).

The NQAIS NAHM web-based tool provides hospitals with a dynamic view of their in-hospital mortality patterns. The primary focus is the most recent rolling 12-month period. Results are displayed by diagnosis in numerical and graphical format. Unusual patterns (signals) are symbolised and colour-coded for ease of recognition. In the rolling 12-month period, records can be identified and selected in order to explain the pattern(s) of interest. Hospitals are provided with a simple two-page template, developed by the HIU, to guide the process of signal reviews and the sharing of learning points nationally.

However, as emphasised elsewhere in this report, mortality patterns should be interpreted with caution, as they may be due to a number of factors not adjusted for in the methodology, including: random (statistical) variation beyond the control limits set for the model; differences in patient characteristics not fully accounted for; accuracy of the principal/admission diagnosis; depth of diagnostic coding, which impacts on the determination of comorbidities; and possible differences in the overall quality of care. Clearly, the overall quality of the available data is dependent on the accuracy and clarity of the clinical recording in the patients' charts and its subsequent coding into HIPE.

Hospital mortality analysis is a statistical screening tool for reviewing the quality of care in hospitals. Results should be interpreted together with other sources of information on quality, including critical event reporting, mortality and morbidity review processes, patient/staff satisfaction, and quality and risk management processes. Furthermore, it should be emphasised once more that SMRs can only be used to examine mortality patterns within a hospital, and not to compare hospitals with one another or to provide a league table of hospital mortality.

ANALYSING AND DISPLAYING THE SMR IN NQAIS NAHM

NQAIS NAHM provides hospitals with a dynamic view of their in-hospital mortality patterns, particularly the SMR. This is a secure web-enabled interface which provides hospitals with an ongoing view of their mortality data. Although the tool displays the most recent full year for which complete data are available, the primary focus for hospitals is the most recent rolling 12-month period.

Key data, including SMRs for hospitals, are extracted from the HIPE system in order to generate mortality data. The International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM) (8th Edition) (National Casemix and Classification Centre, Australian Health Services Research Institute, University of Wollongong, 2013) classification contains approximately 16,800 commonly used codes for diagnostic conditions. Such a large number can be challenging to manage; therefore, the large number of ICD codes is compressed into approximately 290 CCS diagnosis codes using a methodology that was developed by the AHRQ in the United States. The CCS diagnosis codes link together diagnoses that are closely related in their pathophysiology, that present in similar ways, or that are managed in clinically similar manners.

So, for example, the CCS diagnosis group 100, 'acute myocardial infarction', includes conditions such as ICD-10-AM codes I21.0 (acute transmural MI of anterior wall), I21.1 (acute transmural MI of inferior wall), I21.3 (acute transmural MI of unspecified site) and I21.4 (acute subendocardial MI). The CCS approach aims to unite a number of ICD conditions that are clinically similar under one diagnosis code and therefore make them more amenable to analysis for the purposes of planning, audit, evaluation, and quality assurance and improvement. It is different from the diagnosis-related group (DRG) approach, the aim of which is to group together ICD conditions of a similar cost and complexity, and is therefore primarily used as a financial, rather than a clinical, measure.

The SMR used in the NQAIS NAHM web-based tool includes in the analysis patients who have been coded for palliative care (Z51.5 in ICD-10-AM). This differs from some international models, in which patients coded for palliative care are excluded from analysis. The inclusion of palliative care-coded patients ensures that potential inappropriate application cannot take place and also recognises that palliative care does not equate to end-of-life care (Chong *et al*., 2012).

Hospital mortality data are presented in numerical and graphical format for selected time periods, usually one year. NAHM only publishes data using the 99.8% limit statistical test. However, it also presents to system users a more sensitive 95% control limit banding as well. This is in order to provide an early warning system to clinicians and managers, allowing them to closely monitor mortality patterns for potential areas of concern and to respond in a timely manner.

Where an SMR is outside the expected range, hospitals should examine their records in order to understand their SMR pattern. Determining the SMR is an important step, but this should be followed by a local analysis of what this means and what has contributed to this value. The NQAIS NAHM web-based tool has the capacity to identify individual medical records, which can then become the focus of a review of mortality patterns. Hospitals are provided with a template to guide the review process and to facilitate sharing of the learning points.

CHAPTER 3
NAHM DATA IN HOSPITALS

CHAPTER 3

NAHM DATA IN HOSPITALS

HOSPITAL ENGAGEMENT WITH NAHM

NOCA encourages use of NAHM as part of a wider suite of quality indicators. It should always be used in conjunction with staff and patient feedback in order to identify potential learning opportunities to improve clinical care (National Office of Clinical Audit, 2016). Sharing how hospitals engage with and use NAHM is informative and promotes a culture of learning.

NOCA acknowledges the hospitals that have shared their experience this year. The following feedback from hospitals explains how they use their NAHM data:

Mercy University Hospital: NAHM supporting local clinical audit and quality improvement

The data generated from NAHM have proven to be extremely beneficial to the Mercy University Hospital. The hospital now trends its SMRs, mortality rates, and cumulative summary (CuSum) breaches per quarter and circulates the data to the clinical services. Throughout 2017, we used NAHM data to provide a frame of reference for various clinical audits carried out in response to risk management occurrences within the services. This in turn informs improvements in the quality and safety of our clinical services and day-to-day operations in the hospital.

Ms Mary Deasy
Quality and Risk Manager
Mercy University Hospital, Cork

NAHM in University Hospital Waterford: Our journey so far

Three years ago, two unrelated things happened at University Hospital Waterford: clinical directorates were established, and NOCA began to issue the NAHM reports to each acute hospital.

From initially reviewing and analysing the reports in the Quality and Patient Safety Office, we established a quarterly cross-directorate NAHM meeting. The Clinical Directors, senior HIPE coders and Directorate Business Managers met with the Quality and Patient Safety Office to review the healthcare records of low- and/or medium-risk patients who died in University Hospital Waterford.

For those patients in the signal cohort, a HIPE report was requested. If the HIPE output did not answer our questions, the healthcare record was reviewed in more detail. If we were satisfied that the patient's death was explained by the record for that episode of care, no action was taken. If there was an indication that some part of the process of care failed, the group agreed a set of actions, such as education or further audit. If a coding error was identified, we requested a retrospective correction. A quarterly report was brought to the hospital's Executive Management Board on the NAHM findings regarding overall signals at hospital level.

However, there are limitations to the NAHM process in our hospital. We believe that the best way to accurately monitor and interrogate hospital mortality rates/SMRs which may signal patterns of poor clinical care is through morbidity and mortality reviews. These are best used within each specialty/service as part of the ongoing clinical governance of the service.

One very clear action from the outset was the need to create a better understanding among all clinical staff of HIPE coding and how it is used in the Irish healthcare system. This has motivated a range of educational activities targeting documentation standards - which must roll on to accommodate staff turnover, and the bi-annual changeover of hospital doctors.

Judy Colin
Quality and Patient Safety Manager
University Hospital Waterford

KEY RECOMMENDATION

- **Hospitals should continue to use the NQAIS NAHM web-based tool to monitor and review their mortality patterns as part of routine quality improvements and learn from their findings.**

STATISTICAL OUTLIERS

All hospitals and hospital groups have access to their own data locally all year round and can access at all diagnoses, CCS group or individual diagnosis levels. Hospitals are encouraged at all times to view NAHM and become familiar with their own SMRs and mortality figures, especially when data are refreshed or the closure of the HIPE file is approaching.

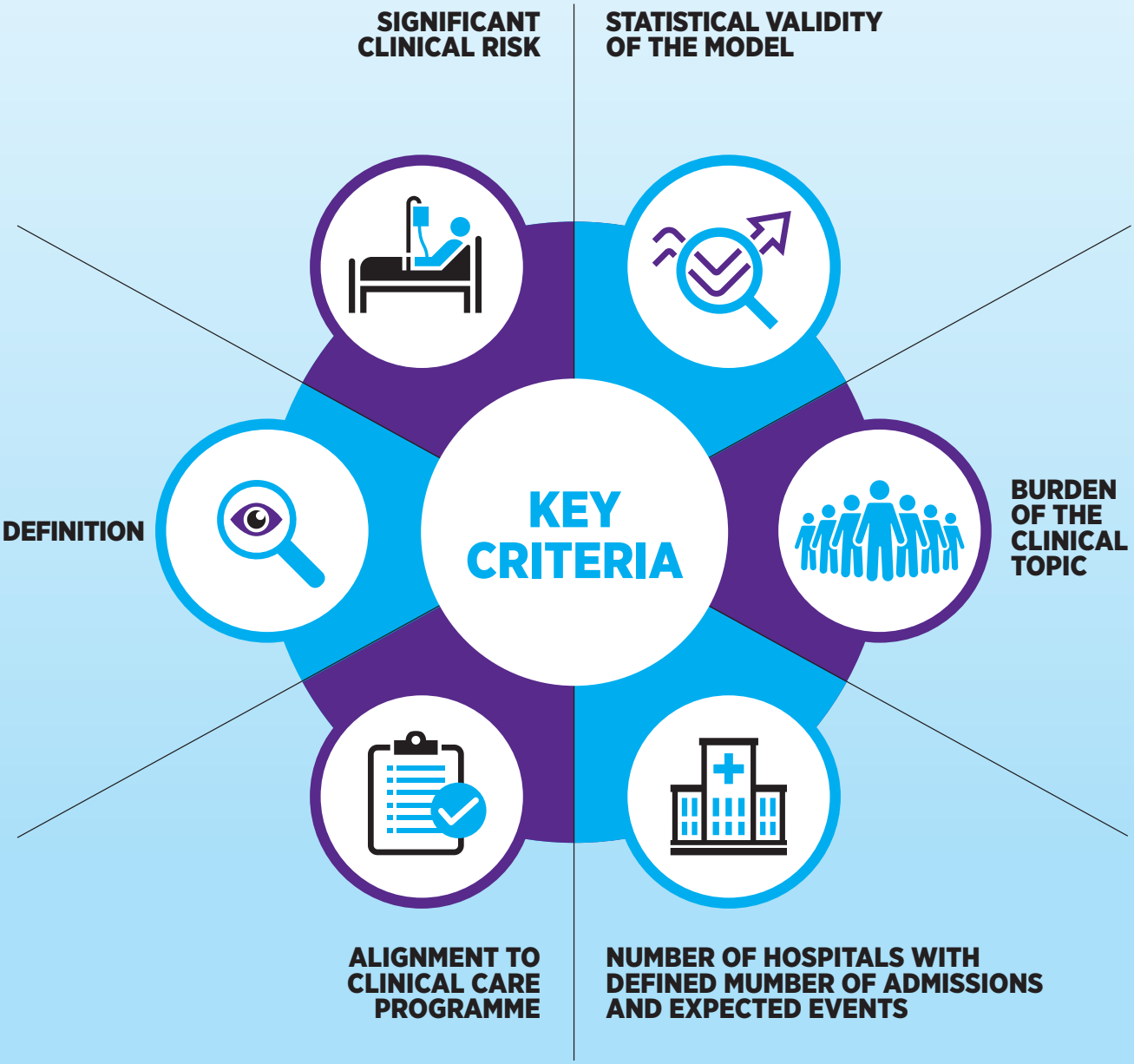
The NAHM Governance Committee defined NAHM statistical outliers as occurring where a hospital's SMR is higher than expected, appearing outside the 99.8% control limits (representing a one in five-hundred probability that this happened by chance alone). This indicates that a hospital with an SMR outside the 99.8% control limits has either greater or fewer deaths than would otherwise be expected. At this point, NOCA requests that hospitals undertake a review of the SMR in accordance with the NOCA Monitoring & Escalation Policy (National Office of Clinical Audit, 2016). This occurs when the SMR signal is deemed to be static for four months back from the end of the previous rolling 12-month period (i.e. six months back from the most recent data available). A finding of a statistical outlier does not in the first instance indicate that a hospital is providing poor-quality care; it only means that the rate was significantly different from what was expected, and that investigation is warranted and should trigger a review in the hospital.

The first step in this process is to establish whether there is a data quality issue or a statistical outlier. If a data quality issue is identified, corrective actions are taken in the hospital. If a statistical outlier is identified, a senior accountable person is appointed by the hospital to conduct a review, as requested by NOCA. Data are analysed and used to prepare a written report outlining the key findings and actions required.

After data assessment, reviews should then encompass case mix, processes and structures of care (Lilford, Mohammed, Spiegelhalter, & Thomson, 2004). To support hospitals, NOCA provides guidance on how to conduct a review. Guidance includes areas to be included in the review report, as well as the individual record review form and pattern review form. Guidance ensures a standardised approach to reviewing NAHM findings, facilitating consistency in the follow-up and reporting process. Hospitals participating in NAHM have a responsibility to carry out these reviews (National Office of Clinical Audit, 2017a; Pavilion Health Australia, 2016). The *NOCA Monitoring and Escalation Policy* (National Office of Clinical Audit, 2017a) has been developed to align with the existing HSE accountability framework. NOCA shares the key learnings arising from hospital reviews and publishes a summary review of any outliers recorded during the year in the *NAHM Annual Report*.

There were no statistical outliers among the SMRs for the six key diagnoses at year-end in the closed HIPE file for 2017 included in this report, nor were there statistical outliers during 2017 for other diagnoses not included in this report. In the *National Audit of Hospital Mortality Annual Report 2016*, St James's Hospital was an outlier for AMI, meaning that its SMR was higher than could be explained by chance alone. An internal review was carried out by the hospital and a summary of its review was included in the report. Its high SMR for AMI continued into 2017 and a further review was carried out by the hospital. A summary of this review can be found in Chapter 6: Cardiovascular key diagnoses, acute myocardial infarction. St James's Hospital's final SMR for AMI at year-end in the closed HIPE file for 2017 is within expected ranges.

CHAPTER 4
FRAMEWORK FOR THE NAHM REPORT



CHAPTER 4

FRAMEWORK FOR THE NAHM REPORT

The NAHM Governance Committee applied inclusion criteria in order to select a cohort of key diagnoses, as shown in Table 4.1.

TABLE 4.1: CRITERIA FOR SELECTION OF KEY DIAGNOSES

	CRITERION	COMMENT	RATIONALE
CLINICAL	**Alignment to National Clinical Programme**	Is there an aligned HSE National Clinical Programme?	HSE National Clinical Programmes provide national leadership for improvement.
CLINICAL	**Burden of the clinical topic**	Is the key diagnosis considered of high volume?	Priority in this report is given to disease associated with the greatest burden to public health and the health system.
CLINICAL	**Significant clinical risk**	Is the key diagnosis considered of significant clinical risk, for example high mortality?	
METHODOLOGICAL	**Definition**	Is the key diagnosis clearly clinically defined?	Only key diagnoses which are explicitly defined are selected for reporting.
METHODOLOGICAL	**Number of hospitals with defined number of admissions and expected events**	Volume of expected deaths ≥5? Is the volume of admissions >100 over the reporting period for the individual diagnosis?	The model is more statistically reliable when these criteria are met.
METHODOLOGICAL	**Statistical validity of the model**	Is the receiver operating characteristic (ROC) statistic >0.7?	This measure calculates the performance of the model in predicting death. A result of >0.7 is considered a satisfactory predictor.

Applying these criteria, the following key diagnoses are included in this report:

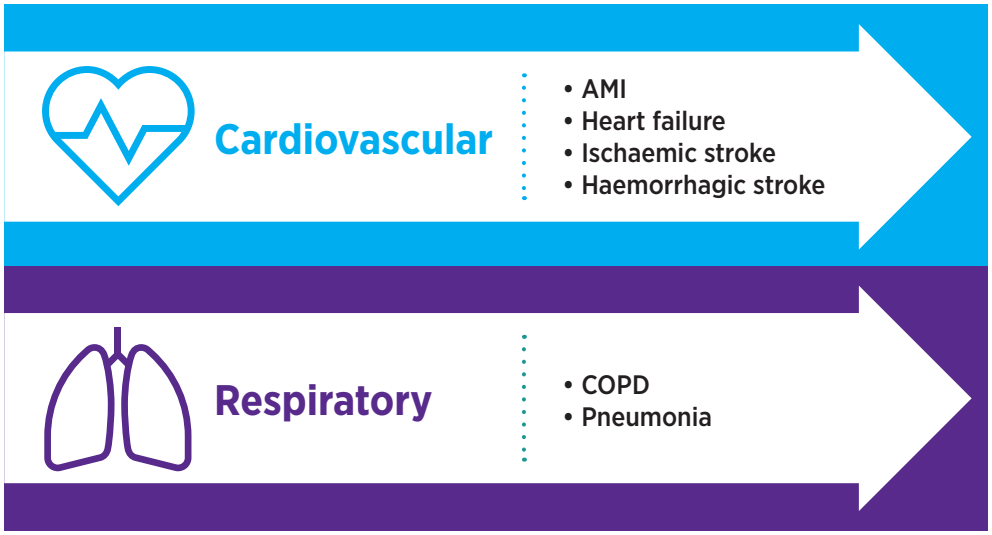


FIGURE 4.1: KEY DIAGNOSES INCLUDED IN REPORT

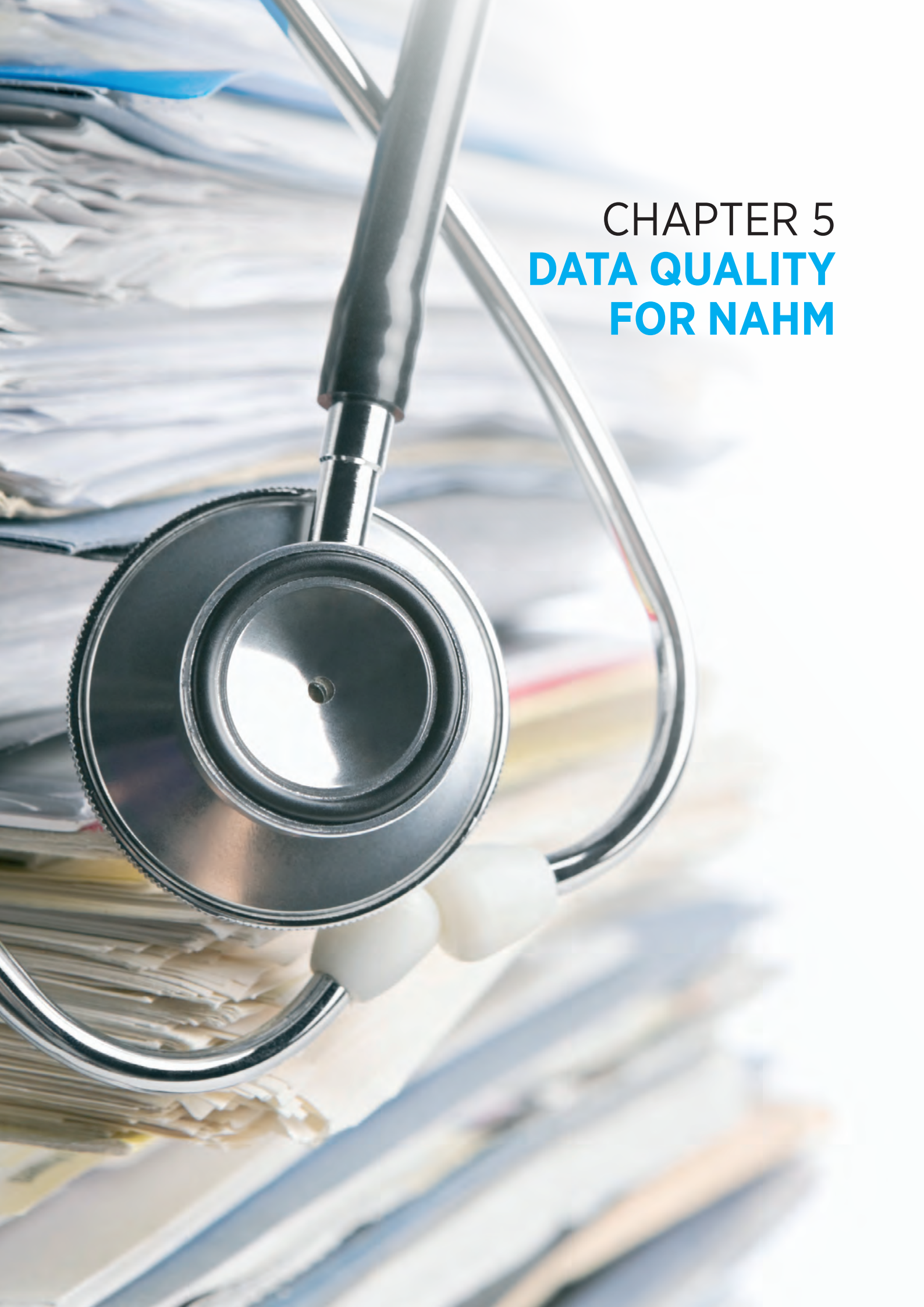
PRESENTATION OF MORTALITY DATA IN THIS REPORT

- Crude mortality rates are given from 2008 to 2017. This approach is used to show the number of inpatients who died as a proportion of the total number of patients admitted for the six key diagnoses. This is presented as a line/trend chart with control limits set at 95%.
- Within each diagnosis – AMI, heart failure, ischaemic stroke, COPD and pneumonia – we present the national in-hospital SMR for 2017 in a funnel plot. Haemorrhagic stroke is presented over a three-year period from 2015 to 2017, due to the smaller number of cases.
- The funnel plot for each diagnosis is supported by a table of figures containing the number of admissions and SMR, with control limits set at 99.8%.
- Update on acute lower respiratory infection (unspecified) is included in Chapter 7: Respiratory key diagnoses.
- The SMRs per diagnosis for individual hospitals are included in the Appendices.
- There is a focus on improvement through HSE National Clinical Programmes.

NATIONAL HEALTHCARE QUALITY REPORTING SYSTEM AND NAHM

The methodological approach used by the Department of Health National Healthcare Quality Reporting System (NHQRS) for the selected diagnoses of AMI, haemorrhagic stroke and ischaemic stroke is the Organisation for Economic Co-operation and Development's (OECD's) direct standardised death rate. This method allows for comparison between Ireland and other countries. The reference population is based on the age and gender profile of the OECD 2010 population admitted to hospital with the selected conditions. This method is of greatest value when it compares practice across international boundaries.

NQAIS NAHM uses an indirect SMR, which adjusts for patient characteristics (see Appendix 2: methodology for measuring in-hospital mortality). This method takes account of a large number of variables which are known to impact on inpatient mortality. This allows hospitals to compare their observed death rate against the death rate that would be expected in that hospital if other variables affecting mortality could be taken into consideration. Therefore, it is an appropriate way to measure in-hospital mortality in Ireland. Due to the differences in methodology, it is not possible to compare in-hospital mortality indicators in this report against those presented by the Department of Health in the NHQRS report.



CHAPTER 5
DATA QUALITY FOR NAHM

DATA IN NAHM

NAHM uses data extracted from HIPE using a clinical coding system called ICD-10-AM/ACHI/ACS (National Centre for Classification in Health, 2014). The HPO oversees collection of HIPE data on behalf of the HSE. HIPE collects morbidity data on inpatient and day patient activity from participating hospitals. Clinical coders in each hospital extract data from the patients' medical notes, discharge summaries and other sources, such as nursing notes, consultation reports, progress notes, and pre- and post-operative notes. An episode of care begins at hospital admission as an inpatient and ends at discharge (or death) from that same hospital (Healthcare Pricing Office, 2018b). A HIPE discharge record is created when a patient is discharged from (or dies in) a hospital. This record contains administrative, demographic and clinical information that reflect on a patient's episode of care.

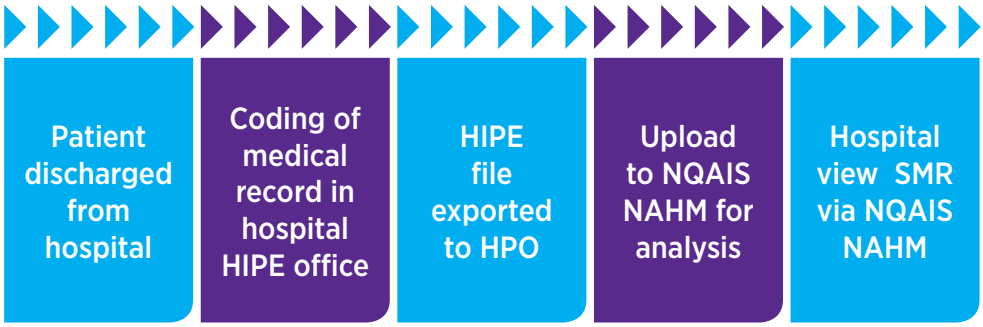


FIGURE 5.1: DATA FLOW IN NAHM

One of the objectives of NAHM is to understand and improve the quality of hospital-based mortality data. By default, this focuses attention not only on HIPE data, but also on clinical documentation for the medical record. Good-quality clinical documentation provides clinicians with information that benefits care management, and provides clinical coders with information that is suitable for coding purposes. Constant collaboration and cooperation with clinical staff within hospitals and nationally is required. There is a continued focus on the need for accuracy and consistency of terminology regarding clinical conditions in clinical documentation. This clear recommendation arises from the independent review of national HIPE data (Pavilion Health Australia, 2016). The publication and implementation of annual reports from NAHM have demonstrated the importance of accurate HIPE data and, by default, accurate clinical documentation. In this chapter, NOCA examines the following aspects of data quality: accuracy of the principal diagnosis, depth of coding, CCI score, and the rate of palliative care coding, all of which impact on NAHM.

ACCURACY OF THE PRINCIPAL DIAGNOSIS

Introduction

SMRs in NAHM are driven by the principal diagnosis of the patient as recorded in the HIPE file. This is the diagnosis which was established after investigation and found to be responsible for the episode of admitted patient care, as represented by a code (National Casemix and Classification Centre, Australian Health Services Research Institute, University of Wollongong, 2013 ACS0001 Principal Diagnosis). A comprehensive assessment of the validity of HIPE data, carried out by Pavilion Health Australia (2016), found the quality of the HIPE data to be sufficiently accurate for the introduction of activity-based funding, but also noted a large variation in coding practices among the hospitals.

Assessment

Hospitals participating in NAHM shared their experience of reviews where the SMR was above the upper control limit in previous NAHM reports. These reviews related to signals coming from COPD in Mater Misericordiae University Hospital (National Office of Clinical Audit, 2016), ischaemic stroke in Cork University Hospital and AMI in St James's Hospital (National Office of Clinical Audit, 2017b). A recurring theme from these reviews was an inaccurate principal diagnosis in HIPE. This may relate to challenges in identifying the diagnosis causing admission to hospital, inadequate clinical documentation, or lack of clarity in coding practice. Where NAHM raises concerns about an SMR, hospitals should carry out a review, including a review of clinical documentation, in order to ensure that the clinical diagnosis is based on diagnostic criteria and accurately reflects clinical activity.

KEY RECOMMENDATION

- **Clinicians and clinical coders in hospitals are encouraged to cooperate and work together to create clear and complete medical record information and also to validate HIPE coding in order to ensure accuracy between coding classifications and clinical care. This can take place through formal specialty meetings, attendance by clinical coders at clinical meetings, etc.**

CHAPTER 5

DEPTH OF CODING

Introduction

There is capacity to include 29 additional diagnoses in HIPE. An additional diagnosis is a condition or complaint either co-existing with the principal diagnosis or arising during the episode of admitted patient care. It is a condition which may affect management and treatment of the patient during the episode of care (Healthcare Pricing Office, 2018a). These additional diagnoses are an important variable in the NAHM model, as some will contribute to a CCI score. Expected deaths are calculated to take account of differences in patient factors, one of which is comorbidities.

Depth of coding represents the number of additional diagnoses coded per patient episode of care. Some conditions may, however, require multiple codes in order to identify a single condition, e.g. open fracture (two codes), sequelae, or external cause codes for a poisoning or injury. Codes used for principal diagnosis never contribute to a CCI score.

COMMENTARY FROM THE HPO: ADDITIONAL DIAGNOSES IN HIPE

The national morbidity data collection is not intended to describe the current disease status of the inpatient population, but rather the conditions that are significant in terms of treatment required, investigations needed, and resources used in each episode of care. For coding purposes, additional diagnoses should be interpreted as conditions that affect patient management in terms of requiring any of the following:

- Commencement, alteration or adjustment of therapeutic treatment diagnostic procedures
- Increased clinical care and/or monitoring (National Casemix and Classification Centre, Australian Health Services Research Institute, University of Wollongong, 2013 ACS 0002 Additional Diagnoses).

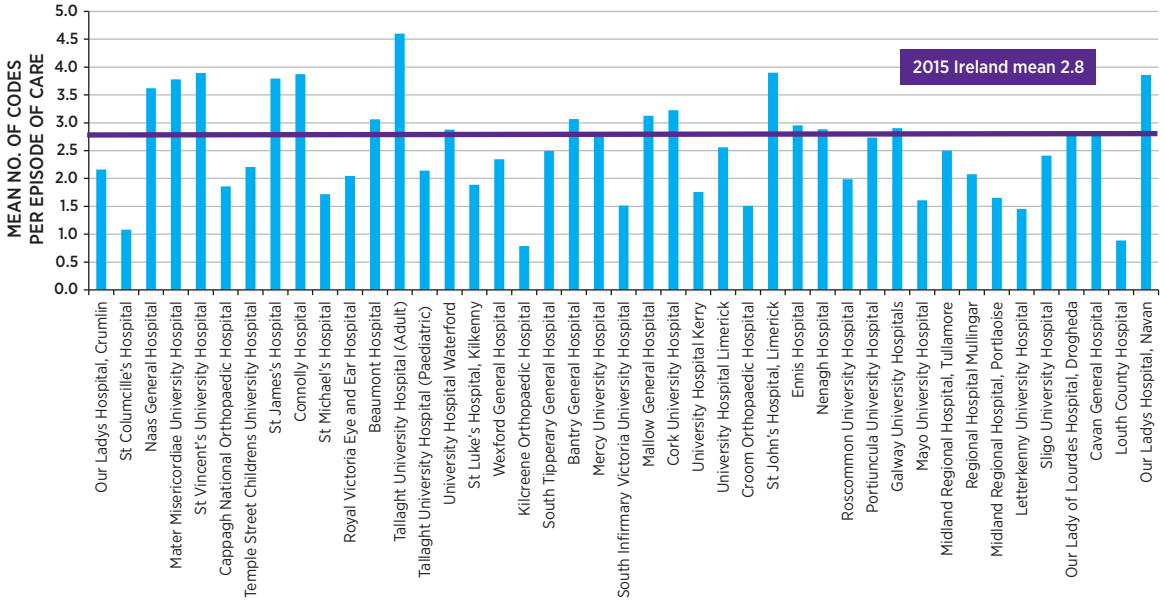
The assignment of additional diagnoses is dependent on the information available in the chart and also on the guidelines laid out in the Australian Coding Standards, specifically ACS0002 Additional Diagnoses. HIPE will only collect those additional diagnoses relevant to the episode of care being coded. The sequencing of the codes applied is guided by the Australian Coding Standards and is in line with morbidity coding practice.

While there is some indication that including more additional diagnoses may contribute to more complete recording of an episode of care, it should be used with caution as an indicator of quality coding. ACS0015 Combination Codes, ACS0025 Double Coding, ACS1901 Poisoning and ACS2001 External Cause Code use and sequencing are examples of additional standards which guide the application of additional codes.

Findings

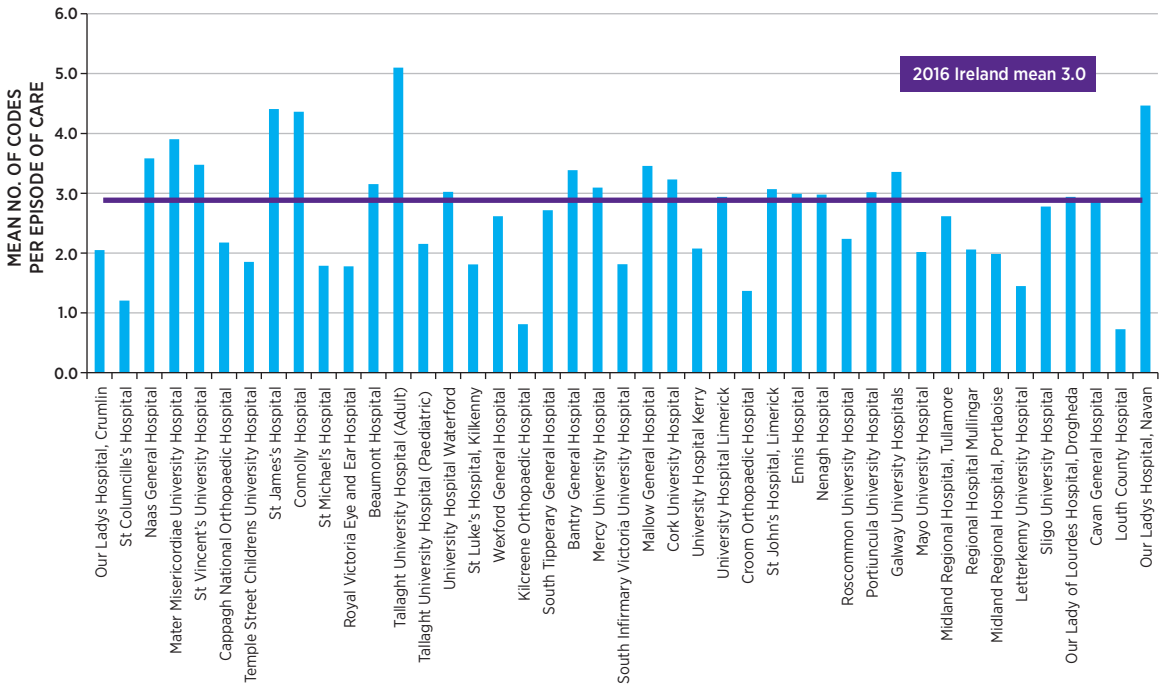
These findings represent all patients admitted to hospitals participating in NAHM and not just admitted patients diagnosed with the six key diagnoses featured in this report.

Figures 5.2 to 5.4 show the mean number of additional diagnoses coded for patients since NQAIS NAHM was initially deployed in 2015, and findings are presented for 2015, 2016 and 2017.



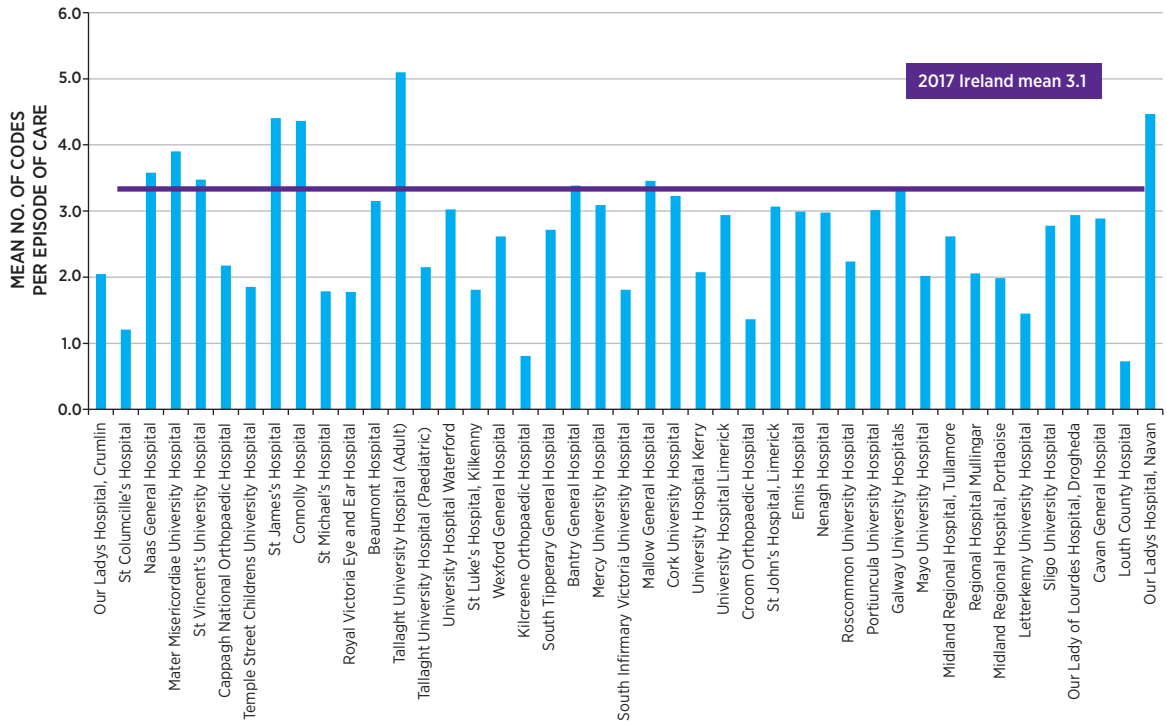
Note: Monaghan Hospital (n=1) has been excluded, due to small numbers.

FIGURE 5.2: MEAN DEPTH OF CODING FOR ALL DIAGNOSES, 2015



Note: Monaghan Hospital (n=1) has been excluded, due to small numbers.

FIGURE 5.3: MEAN DEPTH OF CODING FOR ALL DIAGNOSES, 2016



Note: Monaghan Hospital has been excluded, due to small numbers..

FIGURE 5.4: MEAN DEPTH OF CODING FOR ALL DIAGNOSES, 2017

FIGURE 5.5: NATIONAL MEAN DEPTH OF CODING, 2015–2017

DISCUSSION

NAHM monitors depth of coding. One of the objectives of NAHM is to improve data quality. These findings illustrate variation in depth of coding between hospitals, although this variation is not necessarily unexpected. Where patients with more co-existing comorbidities are admitted to hospital, this should be reflected in clinical documentation and in HIPE. All hospitals are included in Figures 5.2 to 5.4, some with a very different case mix than other hospitals. Alternatively, the variation in mean number of codes per episode of care could simply reflect better documentation in the clinical chart or variations in coding practice at different hospitals.

The supposition that increasing the depth of coding within the CCI condition groups increases the risk associated with a given patient, and therefore impacts on the SMR, is debated. A review by Bottle et al. (2011) of four years of hospital episode statistics data (equivalent to HIPE in Ireland) demonstrated that it was not possible to distinguish whether variation in coding represented different levels of coding than the average, or genuinely higher levels of comorbidity. It concluded, however, that the inappropriate use and application of comorbidity via secondary diagnoses is not common in England. Depth of coding in the United Kingdom (UK) is monitored and presented by the National Health Service's Summary Hospital-level Mortality Indicator scheme. NOCA (2017b) recommends that an initial review of statistical outliers begins with data and, in this case, this is an assessment of the HIPE data on which the NQAIS NAHM statistical analysis has been carried out.

While depth of coding is an arbitrary measurement, ensuring the application of appropriate additional codes ensures a complete medical record. From a coding perspective, the number of additional codes depends on the condition(s) and comorbidities recorded in the medical record or discharge summary. Depth of coding does not indicate data quality; however, this focus on depth of coding may stimulate hospitals to understand and appreciate the importance of the additional diagnoses, not only for NAHM, but also for many other purposes.

Healthcare generates huge volumes of data every day. Clinicians and managers need ready access to accurate and comprehensive data in order to support the delivery of safe, high-quality care. In September 2018, the Health Information and Quality Authority (HIQA) published guidance/standards providing necessary tools to systematically assess, monitor, evaluate and improve data quality for national data collections.

With the advent of clinical audits, such as NAHM, and a focus on HIPE data to support hospital activity-based funding models, data quality for HIPE has never been so important. Attaining high-quality data requires a focused strategic approach. It should be an intrinsic part of the existing governance structures in a hospital (Pavilion Health Australia, 2016). A well-governed and well-managed service also monitors its performance so that it can ensure that high-quality data are produced consistently (Health Information and Quality Authority, 2018).

Well-documented discharge processes are clearly within the scope of the HSE Electronic Health Record programme overseen by the OoCIO, HSE. Such a development would have the potential to improve clinical notes and would support the completion of high-quality discharge summaries. NOCA acknowledges and welcomes this direction as the recommendations progress through procurement and development in 2019.

The accuracy of clinical coding is an important surrogate indicator of the accuracy of patient clinical and administrative records. Ensuring the quality and reliability of HIPE information is a key component of quality improvement. This is one of the fundamental objectives of NAHM. Hospitals should take action to ascertain and improve their data.

KEY RECOMMENDATIONS

- **Hospital management, through governance structures such as Quality and Safety Committees, should actively ensure and, where appropriate, lead and support improvement in data quality.**
- **Clinicians need to fully and accurately complete discharge summaries (Health Information and Quality Authority, 2012). This should be completed for all patients who are discharged from hospital, including those who die in hospital. Where discharge summaries are used to support coding, they should be complete and consistent with source documentation and contain a definitive diagnosis using consistent terminology and all relevant comorbidities.**

COMMENTARY FROM THE HPO: SUPPORTING HOSPITALS TO IMPROVE HIPE DATA

The HPO has a coding audit programme and, in addition, provides hospitals with tools, support and training for HIPE data quality. Following the recommendations in the *National Audit of Admitted Patient Information in Irish Acute Hospitals: National Level Report* (Pavilion Health Australia, 2016), which called for the increased use of audit processes and quality tools, the HPO has purchased the Performance Indicators for Coding Quality (PICQ®) tool following a tendering process.

PICQ® is an objective quality management audit tool for clinically coded data that identifies records in admitted patients (inpatient and day cases) morbidity datasets that may be incorrectly coded by referencing a set of pre-defined indicators. The source of an error may be from documentation issues or coder error. In Ireland, PICQ® is being integrated with the HIPE system to analyse 100% of all episodes submitted overnight.

At the core of PICQ® are the indicators, which are pre-defined to assess errors in degrees of severity attributable across five types of errors while analysing all of the diagnosis and procedure codes within a record. PICQ® can generate user-friendly reports in graph or Excel formats to present to management and clinicians in order to enable them to highlight areas of success or concern.

PICQ® is a further addition to the range of HIPE data quality activities carried out at hospital, hospital group and national levels. This tool is currently being piloted and tested in a number of hospitals, and it is anticipated that it will be available in all Irish hospitals by the end of 2018. It will add quality assurance to HIPE data.

CCI SCORE

Introduction

NAHM uses an indirect standardisation model to calculate expected deaths based on individual patient characteristics, one of which is the presence of existing comorbidities. NAHM uses the CCI (Charlson *et al*., 1987) to assess the risk of mortality for an individual patient. This is a comorbidity measure and the most widely used method to adjust for comorbidities in statistical modelling (Chu *et al*., 2010). The measure is used internationally to assess comorbidities in mortality models, such as the Summary Hospital-level Mortality Indicator and the Dr Foster Hospital Standardised Mortality Ratio in the UK, and is used by the Trauma Audit and Research Network, the Canadian Institute for Health Information and the Netherlands Central Bureau of Statistics.

'Comorbidity' is a term that describes the presence of one or more additional conditions co-existing alongside the principal diagnosis. A score is assigned to 17 key chronic conditions (see Appendix 4) where they appear as additional diagnoses in HIPE. The CCI score is not a severity of illness score; it is a validated tool which predicts risk of mortality within 12 months for patients with certain comorbidities. Some patients may have a number of less acute comorbidities and be critically ill but still have a low CCI score, because their comorbidities do not factor on the CCI. Older patients tend to have a greater burden of significant pre-existing comorbidities.

Within the NQAIS NAHM risk methodology, the CCI score is grouped as follows: <1, 1–5, and >5, with a higher value indicating increased risk associated with comorbidities.

Findings

Figure 5.6 shows the CCI score groupings from the deployment of NQAIS NAHM in 2015 until 2017, for all diagnoses.

	<1 NO SIGNIFICANT PRE-EXISTING COMORBIDITIES	1-5 MODERATE COMORBIDITIES	>5 SEVERE COMORBIDITIES
2015	77%	8%	15%
2016	75%	9%	16%
2017	75%	9%	16%

FIGURE 5.6: NQAIS NAHM NATIONAL CCI SCORE GROUPINGS FOR ALL DIAGNOSES, 2015–2017

CHAPTER 5

PALLIATIVE CARE

Introduction

Palliative care is an approach that improves the quality of life of individuals, as well as of their families, who are facing the problems associated with life-threatening illness. It prevents and relieves suffering through early identification and through the impeccable assessment and treatment of pain and other problems, physical, psychosocial and spiritual. The aim of palliative care is to enhance quality of life and, wherever possible, to positively influence the course of a patient's illness (Health Service Executive National Clinical Programme for Palliative Care, 2017). Care can be provided in any setting.

The HPO has developed the Irish Coding Standard 0224 to provide guidance on the use of code Z51.5 Palliative care for clinical coders and physicians. It states:

> "Z51.5 Palliative care should be assigned (as an additional diagnosis code) when the intent of care at admission is 'for palliation', or if at any time during the admission the intent of care becomes 'for palliation', and the care provided to the patient meets the definition above.
>
> In order to provide clarity for Irish Coders the code Z51.5 Palliative care is to be coded when there is documentation that the patient has been seen by (or attended to) by the palliative care team as the phrase 'for palliation' may not be used." (Healthcare Pricing Office, 2018a, p. 35).

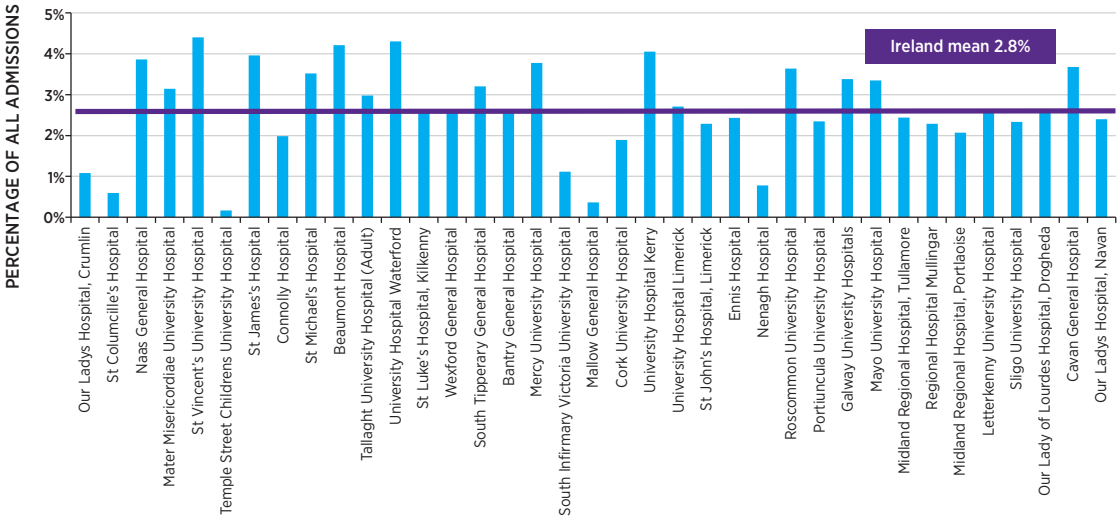
Palliative care and NAHM

The palliative care code is captured in NAHM from the HIPE file, where palliative care is present as an additional diagnosis. The palliative care code and its relationship with the principal diagnosis assigned to a patient's episode of care is weighted in the NAHM risk model.

Findings

Inclusion of the palliative care code is an important variable in the NAHM model for calculating the SMR.

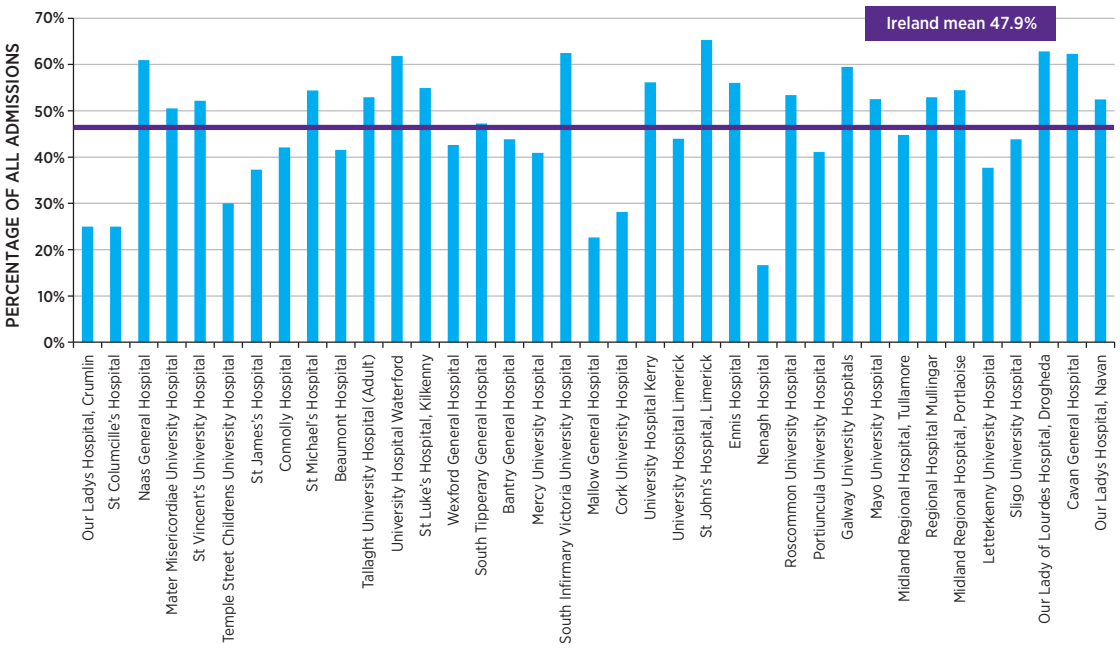
Figure 5.7 presents the percentage of palliative care codes applied to all admissions in all hospitals in 2017 against a national mean percentage of 2.8%. The data presented represent 37 hospitals where the palliative care code was applied to patient admissions across all CCS groups and admission types. Some variation is observed around the application of the code. This is not unexpected. For example, specialist orthopaedic hospitals such as the Cappagh National Orthopaedic Hospital show no use of this code.



Note: Cappagh National Orthopaedic Hospital, Royal Victoria Eye and Ear Hospital, Tallaght University Hospital (Children), Kilcreene Orthopaedic Hospital, Croom Hospital, Louth County Hospital, and Monaghan Hospital have been excluded, due to small numbers.

FIGURE 5.7: APPLICATION OF PALLIATIVE CARE CODE AS A PERCENTAGE OF ALL ADMISSIONS, 2017

Figure 5.8 presents the percentage of palliative care codes applied to deaths in all hospitals against a national mean percentage of 47.9%. Thirty-seven hospitals applied the code to deaths. There is some variation around this percentage, which is not unexpected.



Note: Cappagh National Orthopaedic Hospital Royal Victoria Eye and Ear Hospital, Tallaght University Hospital (Children), Kilcreene Orthopaedic Hospital, Croom Hospital, Louth County Hospital, and Monaghan Hospital have been excluded, due to small numbers.

FIGURE 5.8: APPLICATION OF PALLIATIVE CARE CODE AS A PERCENTAGE OF DEATHS IN ALL DIAGNOSES, 2017

Figure 5.9 presents the national mean rate of application of the palliative care code for all admissions and for deaths. There is a year-on-year increase in the mean coding rate both for all admissions and for deaths.

	ALL ADMISSIONS MEAN	DEATHS MEAN
2015	2.4%	40.6%
2016	2.6%	45.7%
2017	2.8%	47.8%

FIGURE 5.9: NATIONAL MEAN RATE OF APPLICATION OF PALLIATIVE CARE CODE FOR ALL ADMISSIONS AND FOR ALL DEATHS, 2015–2017

Discussion

These findings relate to all admissions and deaths where the palliative care code is applied as an additional diagnosis. There is a higher proportion of deaths with the palliative care code applied than there is for all admissions. The findings demonstrate variation between hospitals, although this variation is not necessarily unexpected. Where there are more patients accessing a palliative care service or being admitted to, or dying in, hospital, this should be reflected in clinical documentation and in HIPE. For example, the National Audit of Hospital Mortality Annual Report 2016 included a hospital review report from Regional Hospital Mullingar highlighting the fact that there were two palliative care support beds in the hospital, accessible only to patients with a need for palliative care and/or end-of-life care. It is unclear how many similarly dedicated beds there are in other acute hospitals. Alternatively, it may simply reflect better documentation in the clinical chart, or variations in coding practice.

One concern about the inclusion of palliative care is that it may increase the risk of inappropriate application of the palliative care code, leading to a reduction in the SMR (Bottle et al., 2011; Chong et al., 2012). In order to mitigate this risk, NOCA monitors the use of the code and makes the rates of palliative care coding transparent (National Office of Clinical Audit, 2016).

COMMENTARY FROM THE HSE PALLIATIVE CARE PROGRAMME: CODE Z51.5

There is only one code in ICD-10-AM for palliative care, Z51.5 (National Centre for Classification in Health, 2014). This palliative care code is 30 years old and was developed when there were no palliative care consultants in Ireland. There are now 43 consultants in this post. The scope and application of the code have changed over the past 30 years. The code does not differentiate between a patient receiving specialist palliative care input (at any stage of their illness) and a patient receiving an approach to care where the sole focus is on comfort care (i.e. a patient for whom the intent of care is 'for palliation', regardless of whether they have been seen by the specialist palliative care team or not).

NOCA update on recommendations contained in the National Audit of Hospital Mortality Annual Report 2016

Palliative Care Recommendation 1: *The NAHM Governance Committee should commission a short life working group to examine the possibility of including a palliative care clinical specialty clinical code in NQAIS NAHM.*

This approach has been investigated by NOCA and the HPO. Due to the structure of our HIPE coding system, it is not currently technically possible to extract any further inference from the Z51.5 Palliative care code.

Palliative Care Recommendation 2: *Guidance aimed at clinical coders is required from both the HSE National Clinical Programme for Palliative Care on interpretation of clinical documentation and the HPO on use of the palliative care code.*

The 10th edition of the Australian Coding Standards was due to be introduced for all patients discharged on or after 1 January 2019. However, due to unforeseen circumstances this update has been deferred to January 2020. The new edition will change how the palliative care code is used. The palliative care coding standard states that the palliative care code will only be coded as an additional diagnosis when there is documented evidence that the patient has received palliative care treatment. Every HIPE coder in Ireland will receive training on the update before its release, including this change to the palliative care coding standard. The National Clinical Programme for Palliative Care will work with the HPO to develop guidance on the interpretation of palliative care code documentation to be included in training. The HPO will provide clarification and further advice to HIPE coders in advance of the introduction of the 10th edition and revised Irish coding standards.

VALIDATION OF DATA IN NAHM

The NAHM Governance Committee, working with international experts, should examine a process to enable the validation of NAHM data following closure of the HIPE file.

Once the HIPE file is closed, there is no opportunity to make amendments to either the HIPE files or to the NAHM data, as the closed HIPE file is the only source of data for analysis in NQAIS NAHM. In order to assist hospitals to have a timely view of NAHM signals approaching the closure of the HIPE file, the NAHM Governance Committee

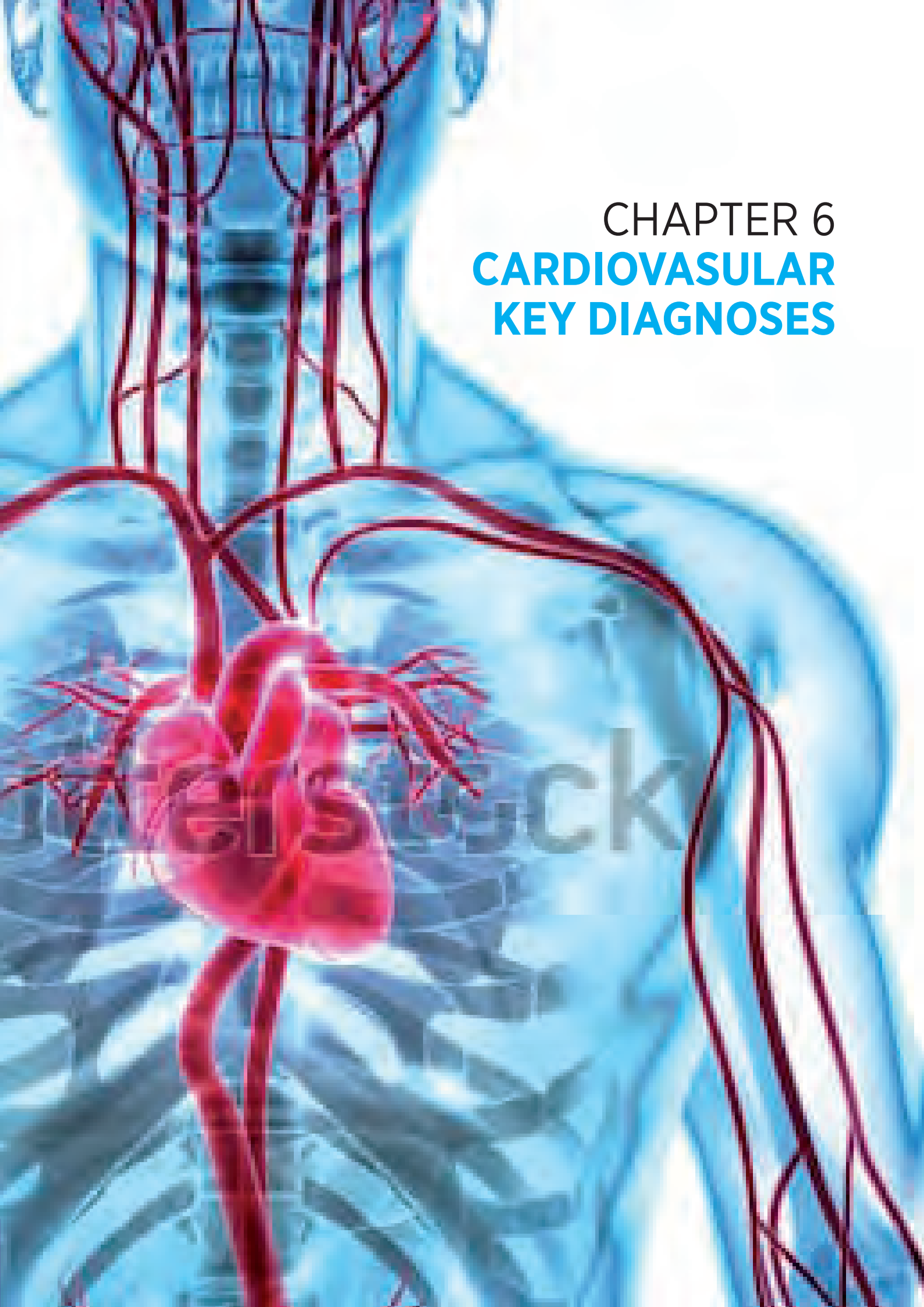
requested two additional uploads of data to NQAIS NAHM, in January and February of each year. A further additional upload of data will be made available when the closed HIPE file is issued. These monthly updates, as the closure of the HIPE file approaches, enable hospitals to review any patterns or diagnoses where the SMR is higher or lower than expected. Hospitals should ensure accuracy of documentation. Where appropriate, hospitals should engage with the local HIPE office and the HPO around coding changes which may be deemed necessary while the file remains open. The inclusion of changes since the last data update, as outlined in Enhancement of the NQAIS NAHM web-based tool in Chapter 8, will help hospitals to identify in a timely manner where a review of signals is required.

Data are updated in NQAIS NAHM at scheduled intervals (Table 5.1). These data are received from the HPO and are up to three months in arrears.

TABLE 5.1: SCHEDULED DATA UPDATES TO NQAIS NAHM DURING 2018 AND 2019

Date of data update in NQAIS NAHM	Data periods included in the NAHM data release	Comments type of update
December 2018	October 2017 to September 2018	Quarterly
January 2019	November 2017 to October 2018	Monthly update
February 2019	December 2017 to November 2018	Monthly update
March 2019	January 2018 to December 2018	Quarterly
April 2019	March 2018 to February 2019	Closed HIPE file
June 2019	April 2018 to March 2019	Quarterly
September 2019	July 2018 to June 2019	Quarterly

The HIPE file was closed on 31 March in both 2017 and 2018. The HPO expects closure of the file on approximately this date each year going forward.



CHAPTER 6
CARDIOVASCULAR KEY DIAGNOSES

CHAPTER 6

CARDIOVASCULAR DIAGNOSES

Cardiovascular disease is the number one cause of death globally; more people die from cardiovascular disease than any other cause (World Health Organization, 2018).

Cardiovascular diseases are a group of disorders affecting the heart and blood vessels. These conditions include coronary heart disease (myocardial infarction and heart attack), cerebrovascular disease (ischaemic and haemorrhagic stroke), heart failure, and rheumatic heart disease.

The NQAIS NAHM web-based tool includes data for all patients who present with a cardiovascular principal diagnosis. All hospitals can access their data locally and conduct reviews as required.

For the purposes of public reporting, the NAHM Governance Committee applied inclusion criteria (see Chapter 4) to the framework for the NAHM report. The following cardiovascular diagnoses meet the reporting criteria:

- Acute myocardial infarction
- Heart failure
- Ischaemic stroke
- Haemorrhagic stroke.

ACUTE MYOCARDIAL INFARCTION

Introduction

A heart attack is a serious medical emergency in which the supply of blood to the heart is suddenly blocked or severely restricted, often by a blood clot, causing serious damage to the heart muscle if not treated quickly (Health Service Executive Clinical Strategy and Programmes Division and Royal College of Physicians of Ireland, 2015). This is called an acute myocardial infarction (AMI). Heart attacks most often occur as a result of coronary heart disease, which the World Health Organization estimates is the leading cause of death worldwide (World Health Organization, 2018).

AMI causes an interruption of blood flow to the heart muscle, which will weaken or permanently damage its ability to function. While there are important clinical differences between subtypes of myocardial infarction (e.g. ST-elevation myocardial infarction (STEMI) and non-ST-elevation myocardial infarction (NSTEMI)) (Health Service Executive Clinical Strategy and Programmes Division and Royal College of Physicians of Ireland, 2015), for the purposes of this report these subtypes are grouped together.

Care of patients with AMI is aimed at restabilising the blood flow to the heart muscle as soon as possible. Ultimately, where there are improvements in reperfusion of the heart muscle through interventions such as percutaneous coronary intervention (PCI) or thrombolysis along with early treatment with aspirin and beta-blockers, this will lead to an improved likelihood of survival.

A reduction in mortality rates for AMI can be attributed to a number of factors, including effective treatments, a decline in the number of people smoking, lower cholesterol levels, and lower blood pressure levels.

The measure presented here is the SMR for AMI, which is fully defined in Appendix 5.

Findings:

A crude in-hospital mortality rate for AMI from 2008 to 2017 is presented in Figure 6.1, with a 95% confidence interval (CI). These data have not been adjusted for differences in age profile or comorbidities over time, but they provide background information to hospital presentations for this time period. This shows a significant reduction (47%) in in-hospital mortality over 10 years, from 9.3 deaths per 100 admissions in 2008 to 4.9 deaths per 100 admissions in 2017.

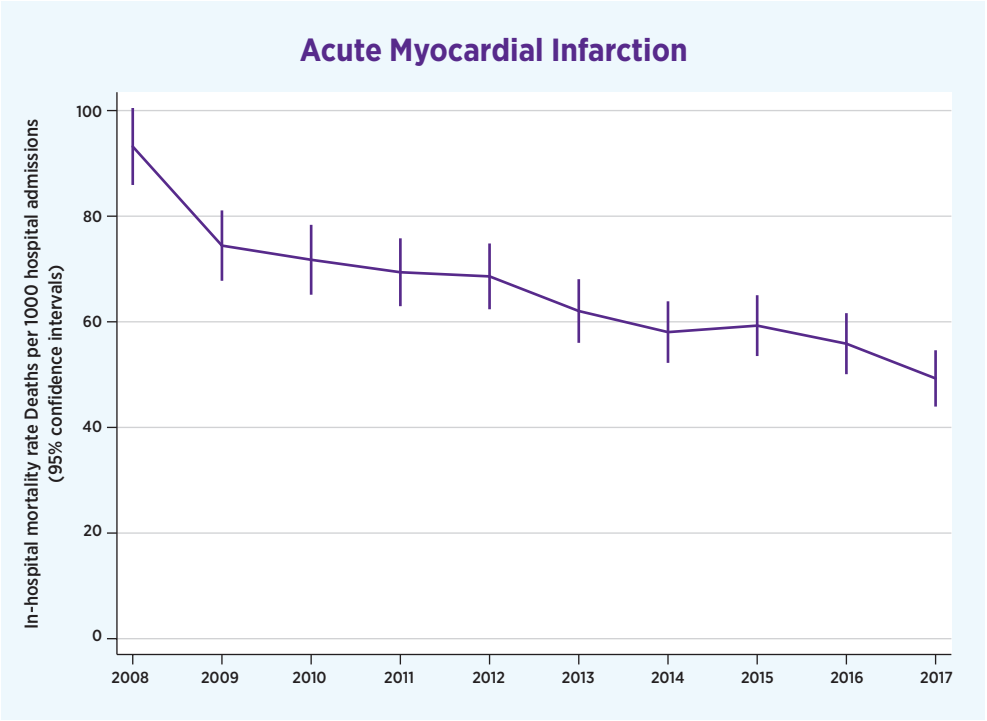


FIGURE 6.1: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF AMI, 2008–2017

- Twenty-three hospitals had more than 100 admitted patients with a principal diagnosis of AMI in 2017; this ranged from 114 to 688 admissions. Figure 6.2 presents the SMR for these hospitals in a funnel plot, with 99.8% control limits. Each individual hospital's control limits are calculated based on their patient details.
- The 23 hospitals included in Figure 6.2 represent 93% of all inpatients admitted with a diagnosis of AMI in 2017.
- All hospitals had an SMR within the control limits of 99.8% indicating that all hospitals SMR's were within the expected range for 2017.
- Twenty-one hospitals are not included in this analysis, as they did not meet the selection criterion relating to a defined number of admissions and expected events.

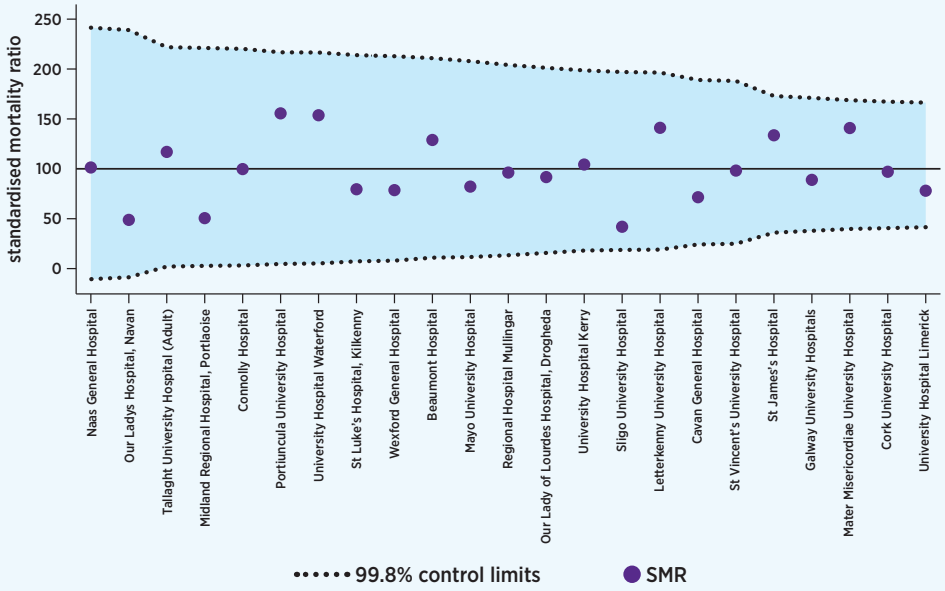


FIGURE 6.2: NATIONAL IN-HOSPITAL SMR FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF AMI, 2017

TABLE 6.1: TABULAR PRESENTATION FOR AMI IN-HOSPITAL MORTALITY, 2017

Hospital Group	Hospital name	No. of admissions for AMI, 2017	SMR -AMI	99.8% control limits
Dublin Midlands Hospital Group	Naas General Hospital	136	101	(-11–241)
	Midland Regional Hospital, Portlaoise	114	51	(3–221)
	St James's Hospital	688	134	(36–173)
	Tallaght University Hospital (Adult)	240	117	(2–222)
Ireland East Hospital Group	Mater Misericordiae University Hospital	514	141	(40–169)
	Regional Hospital Mullingar	124	96	(13–204)
	Our Ladys Hospital, Navan	127	49	(-9–239)
	St Luke's Hospital, Kilkenny	181	80	(7–214)
	St Vincent's University Hospital	273	98	(25–188)
	Wexford General Hospital	219	79	(8–213)
RCSI Hospitals	Connolly Hospital	156	100	(3–220)
	Beaumont Hospital	202	129	(11–211)
	Cavan General Hospital	173	72	(24–189)
	Our Lady of Lourdes Hospital, Drogheda	175	92	(16–201)
Saolta University Health Care Group	Portiuncula University Hospital	116	156	(5–217)
	Galway University Hospitals	513	89	(38–171)
	Letterkenny University Hospital	212	141	(19–196)
	Mayo University Hospital	211	82	(12–208)
	Sligo University Hospital	155	42	(19–197)
South / South West Hospital Group	University Hospital Waterford	165	154	(5–217)
	Cork University Hospital	619	97	(41–167)
	University Hospital Kerry	132	104	(18–199)
UL Hospital Group	University Hospital Limerick	467	78	(41–166)

Providing leadership for improvement: HSE National Clinical Programme for Acute Coronary Syndrome (ACS)

The HSE National Clinical Programme for Acute Coronary Syndrome (ACS) implemented an evidence-based optimal reperfusion service (ORS) protocol for care of patients with STEMI in January 2013. It aimed to improve survival by standardising the approach to care of patients presenting with STEMI. The protocol – along with its monitoring system, HeartBeat – has been operating nationwide for more than five years.

A recent review of patients with a confirmed diagnosis of STEMI demonstrated improvements in pre-hospital care, access to primary percutaneous coronary intervention (PPCI) centres and door-to-treatment times (Health Service Executive National Clinical Programme for Acute Coronary Syndrome and Royal College of Physicians of Ireland, 2018). While much of the focus has been on STEMI, the national ACS working group is preparing a non-ST-elevation acute coronary syndrome (NSTE-ACS) protocol.

Discussion

There are no hospitals with an SMR outside the control limits set at 99.8% for AMI at year end in the closed HIPE file for 2017. During 2017, St James's Hospital, which was a statistical outlier for AMI in 2016, continued to have an SMR above the upper control limit. The clinical and quality teams in St James's Hospital – together with NOCA and with support from the HPO – have carried out a detailed review of source data and coding. An update on the clinical and quality teams' review, which was carried out in line with the *NOCA Monitoring and Escalation Policy* (National Office of Clinical Audit, 2017a), is presented here.

COMMENTARY FROM ST JAMES'S HOSPITAL: REVIEW OF AMI STATISTICAL OUTLIER

Introduction

A review of the AMI signal in St James's Hospital during 2016 identified discrepancies in both transfer activity not captured in the HIPE data and in principal diagnoses being incorrectly coded. Following consultation with the HPO, some medical records in HIPE were re-coded in order to correctly reflect the patient's transfer and AMI diagnosis. A continued high SMR and CuSum signal during 2017 prompted further investigations of AMI data by the Clinical Audit Manager and Consultant Cardiologist, Clinical Lead for Cardiology Services in St James's Hospital. A review of all AMI patients who were discharged from the hospital, or who died during 2017, was carried out by a multidisciplinary team in order to confirm the validity of the data. Records were examined and there were no patient safety risks or clinical concerns identified. The signal and review were brought to the attention of the Clinical Director for Medicine, the Director of Quality and Safety Improvement, and the hospital CEO.

Findings

- The review of the AMI data clearly identified an issue with the accuracy of coding of patients with an AMI diagnosis. Further clarification has been sought from the HPO in conjunction with the National Clinical Programme for ACS.
- As of September 2017, coding of STEMI patients is taken concurrently from the HeartBeat database in order to ensure clinical accuracy. This has already demonstrated a significant improvement in the SMR for Q3 2017.
- The review also indicated a lack of clarity and consistency in the HIPE coding of AMI patients who presented with cardiac arrest. Recent clarification from the HPO has moved to resolve this by providing further clarification on the definition of cardiac arrest and how it is to be coded, see *HSE HPO Coding Notes Issue 79* (Healthcare Pricing Office, 2017, p. 5).
- The re-coding of patients with a primary diagnosis of coronary atherosclerosis into the AMI dataset did not have any impact on the retrospective CuSum, as was expected. This prompted further engagement with NOCA in order to ensure that the corrected data were incorporated into NAHM and to identify any lag period between re-coding and high SMR signal resetting.
- Due to the need to transfer patients acutely in extremis, PPCI centres will have a higher proportion of AMIs and AMI deaths than non-PPCI hospitals.

A comparison of peer/similar cardiology centres in order to ensure consistency and comparability of patient outcomes and coding practices would be useful, and could be facilitated by a model that takes account of the presence of a PPCI centre.

Action plan

- The hospital retrospectively corrected the coding for 2017 in line with its internal coding quality improvement processes.
- Internal validation processes were created to provide service leaders with oversight of the data activity.
- The episodes of care of patients who present with an AMI diagnosis are coded directly/correlated with the HeartBeat portal.
- Further clarification has been sought from the HPO regarding the discrete coding differences of the AMI group. St James's Hospital has incorporated this learning into its coding practices.
- Senior clinicians are engaging with HIPE coders, who are providing education, guidance and clarification on disease specifications.
- HIPE coders are included in the services' clinical outcomes review groups.
- The hospital will observe future updates of NAHM in order to monitor the effect that re-coding and data correction has on the SMR.

Ray Healy
Clinical Audit Manager
St James's Hospital

Dr Caroline Daly
Consultant Cardiologist and
Clinical Lead for Cardiology Services
St James's Hospital

COMMENTARY FROM THE HPO: CODING OF AMI AND CORONARY ARTERY DISEASE

Background

Concerns were raised in St James's Hospital, from a clinical coding point of view, regarding the principal diagnosis of their AMI and coronary artery disease (CAD) patients. Arising from this, the HPO contacted the National Centre for Classification in Health (NCCH) to request clarification on sequencing where a patient has an AMI and has CAD (National Office of Clinical Audit, 2017b, p. 44 & 45).

Situation

The HPO has had interactions with the NCCH regarding this issue, but at the time of writing no solution has been found. A similar query has recently been raised with the NCCH by a hospital in Australia, thus further highlighting the need for clarification. The HPO will continue to liaise with the NCCH on this query.

In light of the issues outlined above, caution must be exercised when reviewing cases with a principal diagnosis of AMI or CAD. Sequencing may be affected by the chart documentation, discharge letter, or other information presented in the medical records to the coder indicating the reason for care and thus guiding the coder towards either condition as a principal diagnosis.

CHAPTER 6

HEART FAILURE

Introduction

Heart failure is an abnormality of cardiac function and structure which reduces the heart's ability to meet the requirements of the body and lungs. It is caused by a progressive weakening of the heart muscle, resulting in its inability to pump sufficient amounts of blood needed to supply organs and other tissues. Heart failure can be caused by a number of other conditions – one of which is AMI, which causes damage to the heart muscle. Heart failure can be classified as an acute or chronic disease process, with worsening disease resulting in admission to hospital.

The measure presented here is the SMR for patients with both acute and chronic heart failure, which is fully defined in Appendix 6.

Findings:

A crude in-hospital mortality rate from 2008 to 2017 for heart failure is presented in Figure 6.3, with a 95% CI. These data have not been adjusted for differences in age profile or comorbidities over time, but they provide background information to hospital presentations for this time period. This shows a significant reduction (26%) in in-hospital mortality over 10 years, from 9.5 deaths per 100 admissions in 2008 to 7.0 deaths per 100 admissions in 2017.

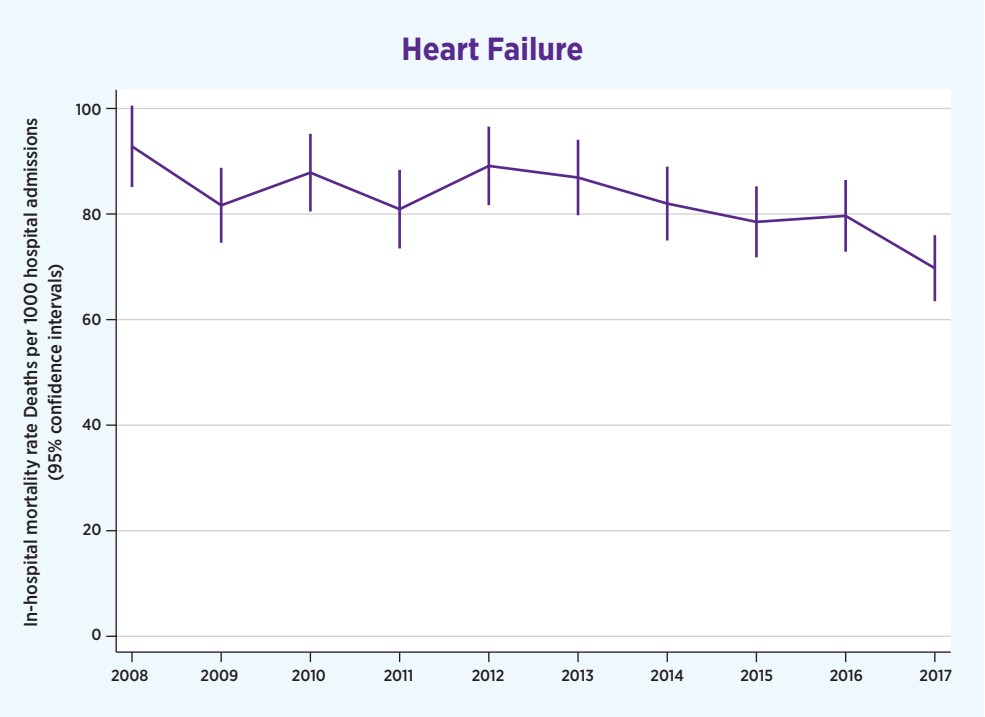


FIGURE 6.3: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF HEART FAILURE, 2008–2017

- Twenty-eight hospitals had more than 100 admitted patients with a principal diagnosis of heart failure in 2017; this ranged from 107 to 355 admissions. Figure 6.4 presents the SMR for these hospitals in a funnel plot with 99.8% control limits. Each individual hospital's control limits are calculated based on their patient details.
- The 28 hospitals included in Figure 6.4 represent 92% of all inpatients admitted with a principal diagnosis of heart failure in 2017.
- All hospitals had an SMR within the control limits of 99.8%, indicating that all hospitals' SMRs were within the expected range for 2017.
- Sixteen hospitals are not included in this analysis, as they did not meet the selection criterion relating to a defined number of admissions and expected events.

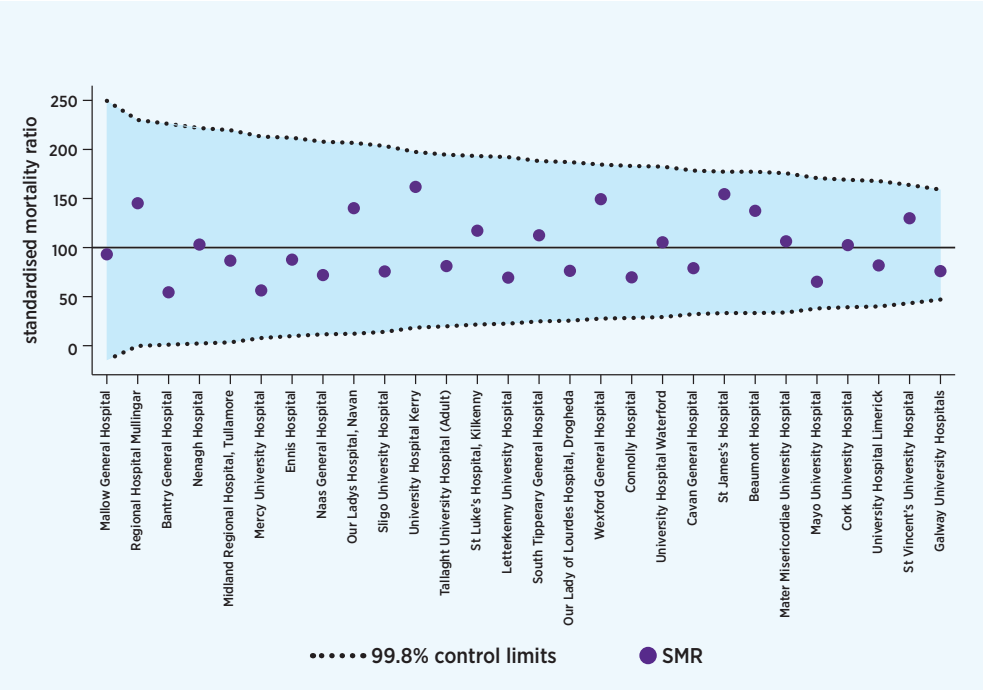


FIGURE 6.4: NATIONAL IN-HOSPITAL SMR FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF HEART FAILURE, 2017

TABLE 6.2: TABULAR PRESENTATION FOR HEART FAILURE IN-HOSPITAL MORTALITY, 2017

Hospital Group	Hospital name	No. of admissions for heart failure, 2017	SMR - heart failure	99.8% control limits
Dublin Midlands Hospital Group	Naas General Hospital	133	72	(12–208)
	St James's Hospital	299	154	(33–177)
	Tallaght University Hospital (Adult)	164	81	(20–195)
	Midland Regional Hospital, Tullamore	129	87	(3–220)
Ireland East Hospital Group	Mater Misericordiae University Hospital	275	106	(34–176)
	Regional Hospital Mullingar	107	145	(0–230)
	Our Ladys Hospital, Navan	162	140	(12–207)
	St Luke's Hospital, Kilkenny	224	117	(22–193)
	St Vincent's University Hospital	333	130	(43–164)
	Wexford General Hospital	240	149	(28–185)
RCSI Hospitals	Connolly Hospital	184	70	(28–183)
	Beaumont Hospital	252	137	(33–177)
	Cavan General Hospital	243	79	(32–178)
	Our Lady of Lourdes Hospital, Drogheda	212	76	(25–187)
Saolta University Health Care Group	Galway University Hospitals	355	76	(47–159)
	Letterkenny University Hospital	217	69	(22–192)
	Mayo University Hospital	339	65	(38–171)
	Sligo University Hospital	156	76	(14–204)
South / South West Hospital Group	Bantry General Hospital	128	54	(1–226)
	Cork University Hospital	349	103	(39–169)
	University Hospital Kerry	163	162	(18–197)
	Mallow General Hospital	116	93	(-15–250)
	Mercy University Hospital	182	56	(8–213)
	South Tipperary General Hospital	157	113	(25–188)
	University Hospital Waterford	178	105	(29–183)
UL Hospital Group	University Hospital Limerick	329	82	(40–168)
	Nenagh Hospital	122	103	(2–222)
	Ennis Hospital	122	88	(10–212)

Providing leadership for improvement: HSE National Clinical Programme for Heart Failure

The HSE National Clinical Programme for Heart Failure aims to reorganise the way heart failure patients are managed across the health service, both in acute hospital and community settings. Currently, there are 12 sites operating the structured heart failure model, with an increasing focus on community care and prevention (Health Service Executive, 2018).

Discussion

Currently, there is an estimated 2% prevalence of symptomatic heart failure in the Irish population (rising to 10% in those aged 75 years or older), with an additional 2% of the population having asymptomatic left-sided heart failure which is at risk of progressing to symptomatic failure. This highlights the considerable public health burden of heart failure (Health Service Executive, 2018). These findings focus on patients admitted with a principal diagnosis of heart failure, which is acknowledged as a global health challenge.

The recent UK *National Heart Failure Audit: April 2015 – March 2016* (Donkor *et al.*, 2017) suggests continuing improvements in heart failure diagnosis and management. The mortality rate for patients hospitalised with heart failure was significantly lower in 2015–2016, at 8.9%, than in 2014–2015 (9.6%). Of interest, there was a lower mortality rate for patients admitted to cardiology wards. These findings are not directly comparable, due to different inclusion criteria, with the UK *National Heart Failure Audit: April 2015 – March 2016* focusing on emergency hospital admissions with heart failure. However, it has the potential to provide an international comparison. While the aim of NAHM is to support improvements in quality of care, consideration should be given to aligning the NAHM inclusion criteria with those of comparable reports in other countries in order to enable this benchmarking.

KEY RECOMMENDATION

- **The possibility of expanding the review of heart failure in order to enable broader benchmarking should be explored by the HSE National Clinical Programme for Heart Failure working with the NAHM Governance Committee.**

CHAPTER 6

STROKE

A stroke is a serious, life-threatening medical condition that occurs when the normal blood supply to part of the brain is interrupted or cut off by a blockage or rupture of a blood vessel. Like all organs, the brain needs oxygen and nutrients provided by blood in order to function properly. If the supply of blood becomes interrupted or cut off, brain cells begin to die rapidly. When the affected brain cells die, the motor, visual or cognitive function (e.g. speech) controlled by these cells stops working. Depending on the location and size of the affected area, a stroke can lead to very significant brain injury and disability, possibly even death. Stroke affects 17 million people worldwide each year and it is the third leading cause of death and second leading cause of dementia. In Ireland, HIPE recorded a total of 5,392 strokes (codes I61, I63 and I64) in 2017, and approximately 7,000 admissions with stroke were recorded in the Irish Heart Foundation/HSE National Stroke Audit Rehabilitation Units 2016 (McElwaine et al., 2016).

There are two main types of stroke:

- **Ischaemic**, where the blood supply to the brain is stopped due to a blood clot; this accounts for approximately 85% of all strokes.
- **Haemorrhagic**, where a weakened blood vessel supplying the brain ruptures, causing bleeding into or around the brain. This accounts for the remaining percentage of strokes (King's College London for the Stroke Alliance for Europe (SAFE), 2017).

ISCHAEMIC STROKE

Introduction

Ischaemic stroke is the most common form of stroke. In an ischaemic stroke, blood flow to the brain is interrupted either by the formation of a clot in situ in a blood vessel in the brain (cerebral thrombosis) or by movement of a clot from elsewhere in the body's circulatory system (usually from the heart, but also from the diseased wall of the aortic arch or carotid artery), which in turn causes blockage in a blood vessel in the brain (cerebral embolism). The NHQRS reports that in 2015, the average age- and sex-standardised in-hospital mortality rate within 30 days of admission with ischaemic stroke in Ireland was above the OECD average rate (9.1 deaths per 100 cases admitted for Ireland in that year compared with the OECD average of 8.2 deaths per 100 cases admitted). However, this difference was not statistically significant (Department of Health, 2018) and the rate has been falling steadily since the first *Irish Heart Foundation National Audit of Stroke Care* reported an all-cause stroke mortality of 19% (Horgan *et al.*, 2008).

Although there are several classifications for ischaemic stroke, the measure presented here is the SMR for all classifications of ischaemic stroke. This is fully defined in Appendix 7.

Findings

A crude in-hospital mortality rate from 2008 to 2017 for ischaemic stroke is presented in Figure 6.5, with a 95% CI. These data have not been adjusted for differences in age profile or comorbidities over time, but they provide background information to hospital presentations for this time period. This shows a significant reduction (28%) in in-hospital mortality over 10 years, from 13.4 deaths per 100 admissions in 2008 to 9.7 deaths per 100 admissions in 2017.

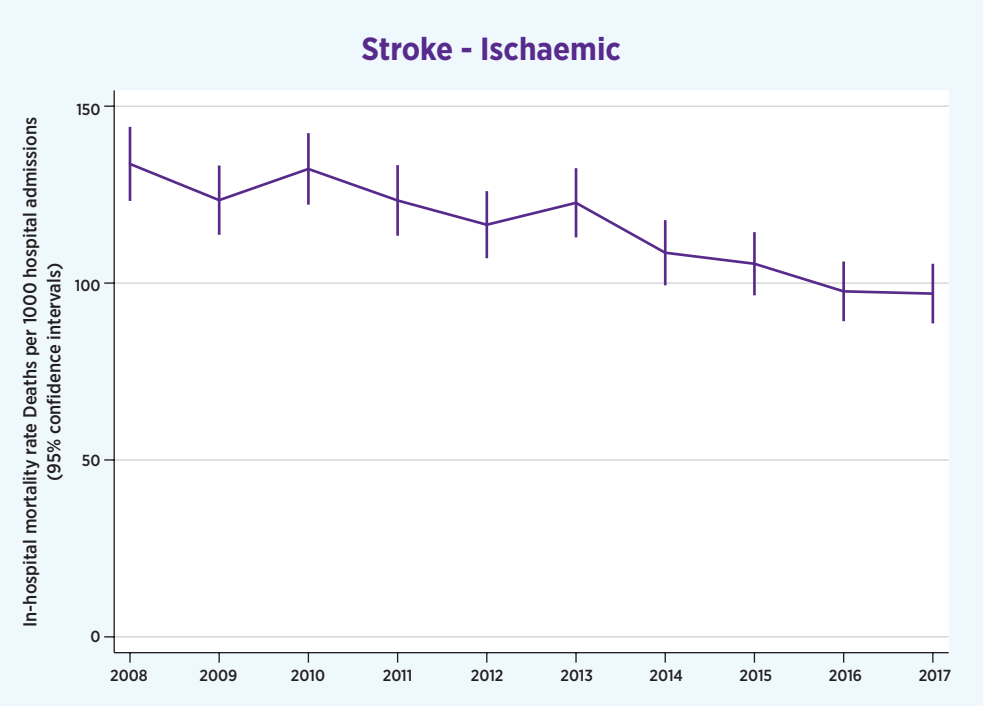


FIGURE 6.5: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF ISCHAEMIC STROKE, 2008–2017

- Nineteen hospitals had more than 100 admitted patients with a principal diagnosis of ischaemic stroke in 2017; this ranged from 102 to 551 admissions. Figure 6.6 presents the SMR for these hospitals in a funnel plot with 99.8% control limits. Each individual hospital's control limits are calculated based on their patient details.
- The 19 hospitals included in figure 6.6 represent 86% of all inpatients admitted with a principal diagnosis of ischaemic stroke in 2017.
- All hospitals had an SMR within the control limits of 99.8% indicating that all hospitals SMR's were within the expected range for 2017.
- Twenty-five hospitals are not included in this analysis, as they did not meet the selection criterion relating to a defined number of admissions and expected events.

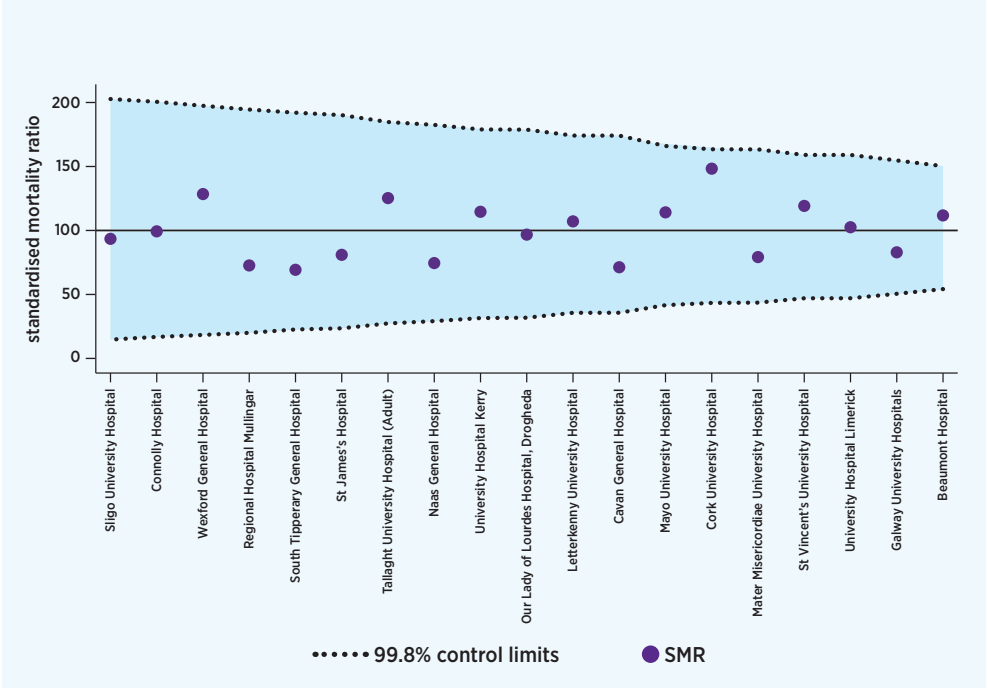


FIGURE 6.6: NATIONAL IN-HOSPITAL SMR FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF ISCHAEMIC STROKE, 2017

TABLE 6.3: TABULAR PRESENTATION FOR ISCHAEMIC STROKE IN-HOSPITAL MORTALITY, 2017

Hospital Group	Hospital name	No. of admissions for ischaemic stroke, 2017	SMR – ischaemic stroke, 2017	99.8% control limits
Dublin Midlands Hospital Group	Naas General Hospital	145	75	(29–183)
	St James's Hospital	220	81	(23–190)
	Tallaght University Hospital (Adult)	203	125	(27–185)
Ireland East Hospital Group	Mater Misericordiae University Hospital	284	79	(44–163)
	Regional Hospital Mullingar	102	73	(20–195)
	St Vincent's University Hospital	240	119	(47–159)
	Wexford General Hospital	121	128	(18–197)
RCSI Hospitals	Connolly Hospital	152	99	(17–201)
	Beaumont Hospital	551	112	(54–150)
	Cavan General Hospital	135	71	(36–174)
	Our Lady of Lourdes Hospital, Drogheda	161	97	(32–179)
Saolta University Health Care Group	Galway University Hospitals	284	83	(50–155)
	Letterkenny University Hospital	177	107	(36–174)
	Mayo University Hospital	182	114	(42–166)
	Sligo University Hospital	143	93	(15–203)
South / South West Hospital Group	South Tipperary General Hospital	103	69	(23–192)
	Cork University Hospital	407	148	(43–163)
	University Hospital Kerry	143	115	(31–179)
UL Hospital Group	University Hospital Limerick	301	103	(47–159)

Discussion

Crude mortality from stroke has been falling since the *Irish Heart Foundation National Audit of Stroke Care* reported a mortality of 19% in 2008 and 14% in 2015, and the 2017 national stroke register reports a crude mortality of 11.3% from ischaemic stroke. However, mortality was not expressed as an SMR in those reports. SMR is used in this report to capture case mix complexity and is the methodology used in other national audits, such as the UK Sentinel Stroke National Audit Programme (SSNAP). However, data on stroke severity are not included and mortality is not defined by time post-stroke, which can influence any comparisons.

In addition, while it is very reassuring that all hospitals are within their respective CIs for SMR, there is variation in the classification of ischaemic stroke. Many institutions are still using the original World Health Organization 1976 definition (Hatano, 1976) specifying a duration of neurological symptoms longer than 24 hours, although many more are now favouring the 2013 American Heart Association/American Stroke Association classification of stroke (Sacco *et al*., 2013), which is often based on neuroimaging. HIPE coding may not be sensitive to this variability. It is hoped that an updated definition of stroke will be issued by the European Stroke Organisation in the coming year.

HAEMORRHAGIC STROKE

Introduction

Intracerebral and subarachnoid haemorrhages, caused by ruptured blood vessels that lead to bleeding in the brain, cause haemorrhagic stroke (Heartbeat Trust, Irish Heart Foundation and National University of Ireland Galway, 2015). Brain haemorrhages should only be classified as stroke if they are non-traumatic, caused by a vascular event and result in injury or ischaemia to the central nervous system/brain. Haemorrhagic stroke occurs less frequently than ischaemic stroke, but can have much higher associated mortality and morbidity (Sacco *et al*., 2013).

The NHQRS reports that in 2015, the average age- and sex-standardised in-hospital mortality rate within 30 days of admission with haemorrhagic stroke in Ireland was above the OECD average rate (23.5 deaths per 100 cases for Ireland in that year compared to the OECD average of 22.5 deaths per 100 cases), although this difference is not statistically significant (Department of Health, 2018).

The measure presented here is the SMR for patients who were admitted to hospital with haemorrhagic stroke, which is fully defined in Appendix 8. Due to the low numbers of patients with a principal admission diagnosis of haemorrhagic stroke, figures for the three-year period from 2015 to 2017 are presented.

Findings:

A crude in-hospital mortality rate from 2008 to 2017 for haemorrhagic stroke is presented in Figure 6.7, with a 95% CI. These data have not been adjusted for differences in age profile or comorbidities over time, but they provide background information to hospital presentations for this time period. This shows no significant reduction (10%) in in-hospital mortality over 10 years, from 30 deaths per 100 admissions in 2008 to 27.1 deaths per 100 admissions in 2017.

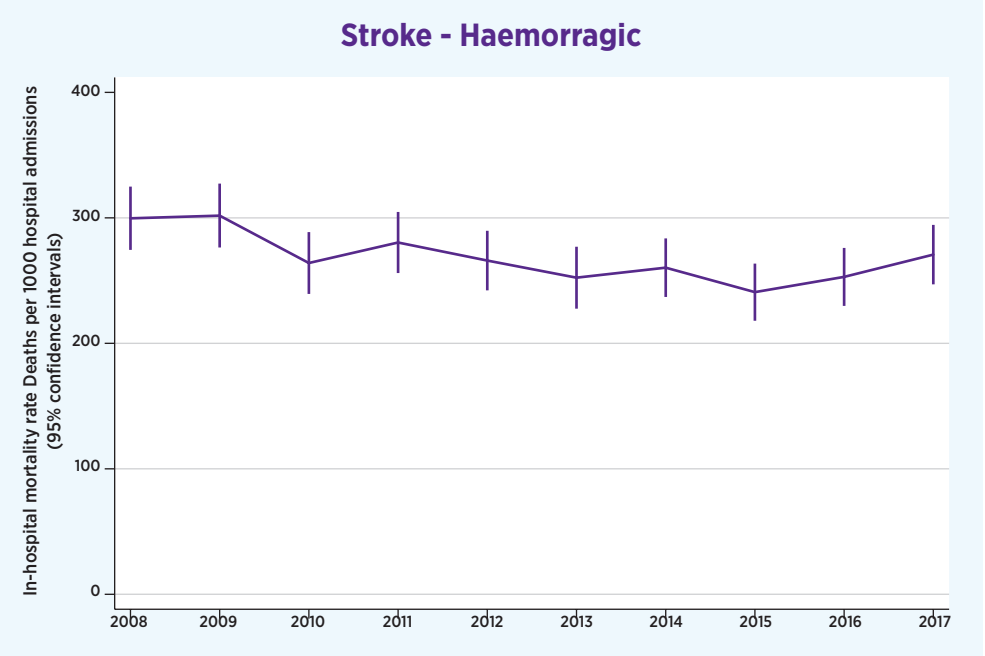


FIGURE 6.7: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF HAEMORRHAGIC STROKE, 2008–2017

- Twelve hospitals had more than 100 admitted patients with a principal diagnosis of haemorrhagic stroke between 2015 and 2017; this ranged from 102 to 909 admissions. Figure 6.8 presents the SMR for these hospitals in a funnel plot with 99.8% control limits. Each individual hospital's control limits are calculated based on their patient details.
- The 12 hospitals included in figure 6.8 represent 73% of all inpatients admitted with a principal diagnosis of haemorrhagic stroke between 2015 and 2017.
- All hospitals had an SMR within the control limits of 99.8% indicating that all hospitals SMR's were within the expected range for 2017.
- Thirty-two hospitals are not included in this analysis, as they did not meet the selection criterion relating to a defined number of admissions and expected events.

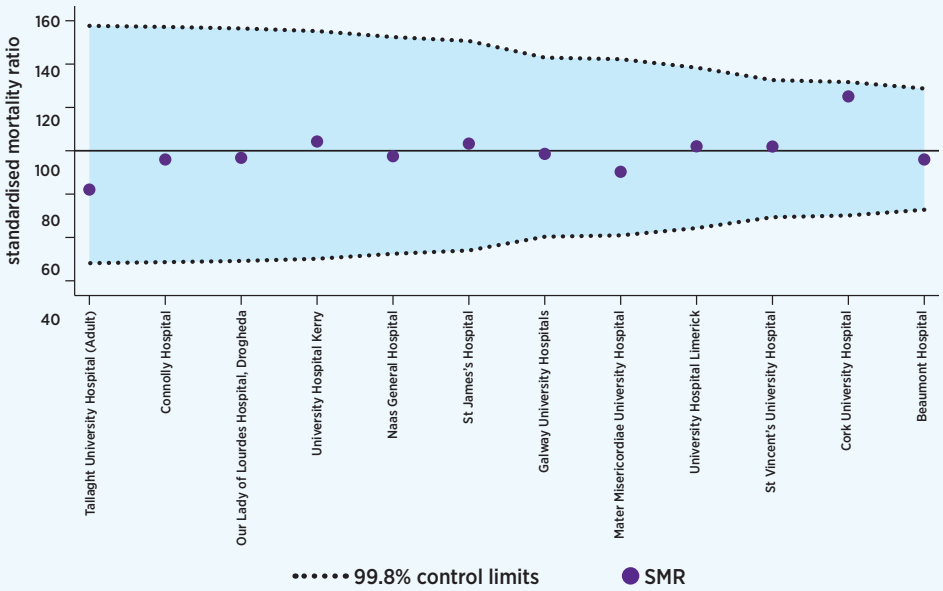


FIGURE 6.8: NATIONAL IN-HOSPITAL SMR FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF HAEMORRHAGIC STROKE, 2015-2017

TABLE 6.4: TABULAR PRESENTATION FOR HAEMORRHAGIC STROKE IN-HOSPITAL MORTALITY, 2015–2017

Hospital Group	Hospital name	No. of admissions for haemorrhagic stroke, 2015–2017	SMR – haemorrhagic stroke, 2015–2017	99.8% control limits
Dublin Midlands Hospital Group	Naas General Hospital	111	97	(52–152)
	St James's Hospital	156	103	(54–151)
	Tallaght University Hospital (Adult)	130	82	(48–158)
Ireland East Hospital Group	Mater Misericordiae University Hospital	216	90	(61–142)
	St Vincent's University Hospital	280	102	(69–133)
RCSI Hospitals	Connolly Hospital	102	96	(49–157)
	Beaumont Hospital	909	96	(73–129)
	Our Lady of Lourdes Hospital, Drogheda	104	97	(49–156)
Saolta University Health Care Group	Galway University Hospitals	164	99	(60–143)
South / South West Hospital Group	Cork University Hospital	467	125	(70–132)
	University Hospital Kerry	106	104	(50–155)
UL Hospital Group	University Hospital Limerick	242	102	(64–138)

Discussion

The mortality from haemorrhagic stroke remains high, reported at more than 36% in the *National Stroke Register Annual Report 2017*. This reflects the lack of any new treatment for intracerebral haemorrhage, and the noted trend of slightly increased crude mortality from intracerebral haemorrhage may reflect other associated factors, including an ageing demography and comorbidities. This potential trend and the need for effective acute treatments for haemorrhagic stroke require further research.

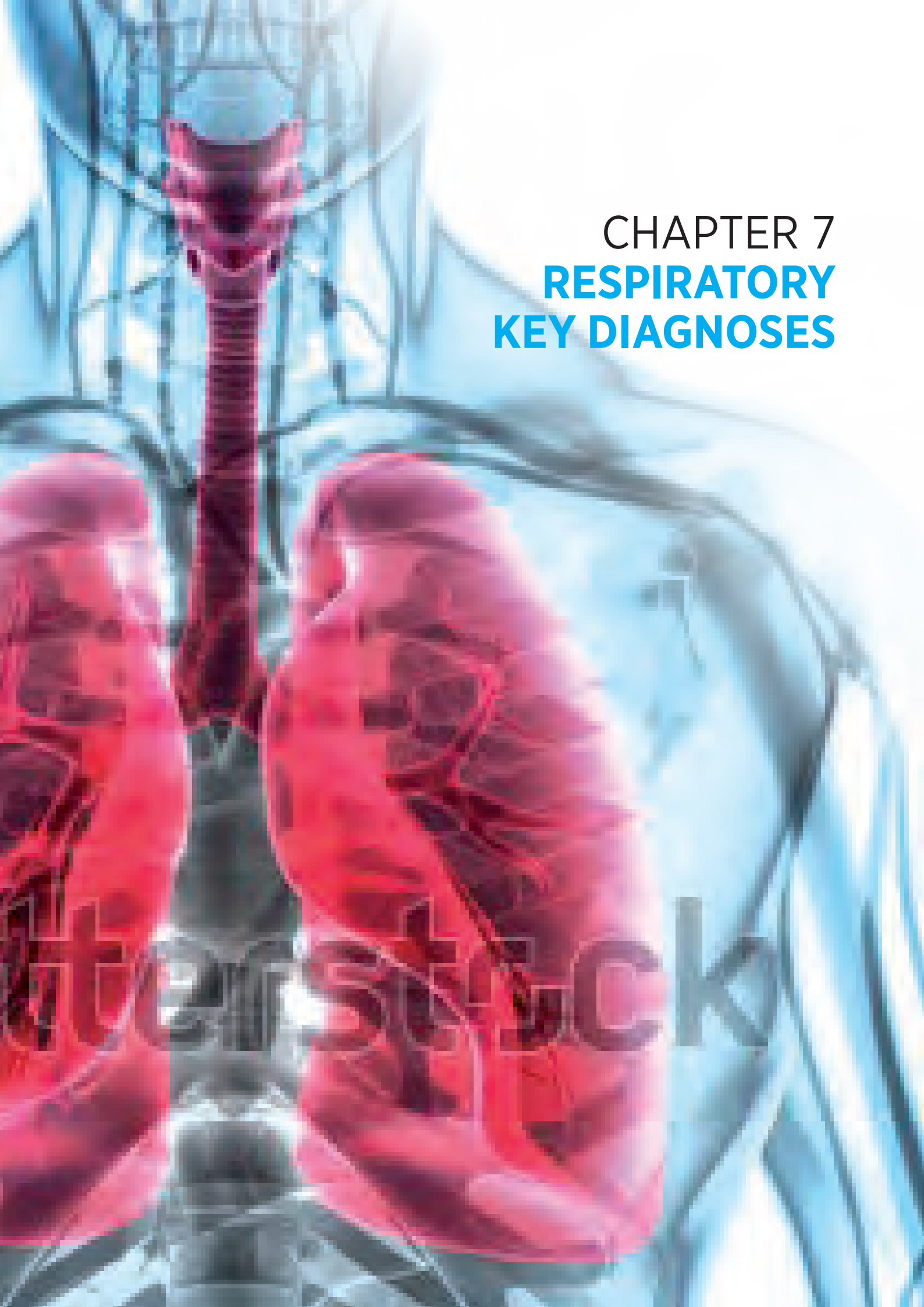
Providing leadership for improvement: HSE National Clinical Programme for Stroke

Stroke (both ischaemic and haemorrhagic) is recognised as a leading cause of mortality and disability. Since its implementation in 2010, the HSE National Clinical Programme for Stroke has prioritised improving outcomes for stroke patients. Key objectives include prevention of stroke, access to quality stroke service, and reduction of death and disability. Acute stroke treatment has improved through the systematic organisation of services, including the appointment of specialist stroke leads in hospitals, setting stroke unit care as the expected standard of care, wider availability of stroke thrombolysis (clot busting) and the implementation of a national thrombectomy (clot retrieval) service. This, together with the implementation of process-of-care and rehabilitation standards (including the development of early supported discharge services), has resulted in improved outcomes and reduced length of stay over the past 10 years for stroke patients in Ireland. Twenty-three Irish hospitals receiving patients with acute strokes now have dedicated acute stroke units. In 2017, 83% of stroke patients were admitted to a hospital with a stroke unit; this figure is unchanged since 2015, although only 68% of stroke patients receive acute stroke unit care (HSE National Clinical Programme for Stroke, 2017, personal communication).

With the demography and prevalence risk factors, the Stroke Alliance for Europe's report, *The Burden of Stroke in Europe*, has predicted a 59% rise in the incidence of stroke in Ireland from 2015 to 2035, with a corresponding 85% increase in total deaths from stroke over that period (King's College London for the Stroke Alliance for Europe (SAFE), 2017). This will represent a major healthcare challenge.

The National Stroke Register has been the national reporting audit for stroke standards and processes of care in Ireland since 2012. The 2017 report includes data on approximately 3,500 cases of stroke from the 19 eligible acute hospitals. For the first time, the 2017 report has included data on patient functional status as a modified Rankin score, pre- and post-stroke, as a marker of stroke severity and outcome. The Register plans to incorporate the National Institutes of Health Stroke Scale (NIHSS) as the acute assessment of severity in future iterations.

Professor Rónán Collins and Joan McCormack, HSE National Clinical Programme for Stroke



CHAPTER 7
RESPIRATORY KEY DIAGNOSES

CHAPTER 7

RESPIRATORY DIAGNOSES

Respiratory diseases are diseases of the airways and other structures of the lung. Some of the most common are chronic obstructive pulmonary disease (COPD), asthma, occupational lung diseases and pulmonary hypertension. Data on these diseases, among others, are available to hospitals to view locally on the NQAIS NAHM web-based tool.

This chapter presents data on the following diagnoses, which are the three most common causes of respiratory hospitalisations in Ireland:

- Chronic obstructive pulmonary disease (COPD)
- Pneumonia
- Acute lower respiratory infection (unspecified).

CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

Introduction

Chronic obstructive pulmonary disease (COPD) is a progressive, life-threatening lung disease that causes breathlessness and is the most common chronic respiratory disease in adults. COPD develops slowly and can remain undiagnosed for many years. Globally, the most common cause of COPD remains tobacco smoke and the exposure to both indoor and outdoor air pollution. However, with changes in levels of tobacco exposure, there is increasing evidence of the adverse impact of childhood factors and the roles of genetics. COPD is currently the fourth leading cause of death worldwide and is predicted to become the third by 2020 (Global Initiative for Chronic Obstructive Lung Disease, 2018).

COPD is characterised by persistent respiratory symptoms and airflow limitation that is due to airway and/or alveolar abnormalities usually caused by significant exposure to noxious particles or gases. The chronic airflow limitation that is characteristic of COPD is caused by a mixture of small airways diseases (e.g. obstructive bronchiolitis) and parenchymal destruction (e.g. emphysema), although the relative contributions of these two factors vary from person to person (Global Initiative for Chronic Obstructive Lung Disease, 2018). COPD has considerable impacts both on the quality and quantity of the patient's life, involving long-term medical care and frequent hospital admissions for many, and often ending in premature death.

The measure presented here is the SMR for COPD, which is fully defined in Appendix 9.

Findings:

A crude in-hospital mortality rate from 2008 to 2017 for COPD is presented in Figure 7.1, with a 95% CI. These data have not been adjusted for differences in age profile or comorbidities over time, but they provide background information to hospital presentations for this time period. These data show no significant reduction (18%) in in-hospital mortality over 10 years, from 4.2 deaths per 100 admissions in 2008 to 3.5 deaths per 100 admissions in 2017.

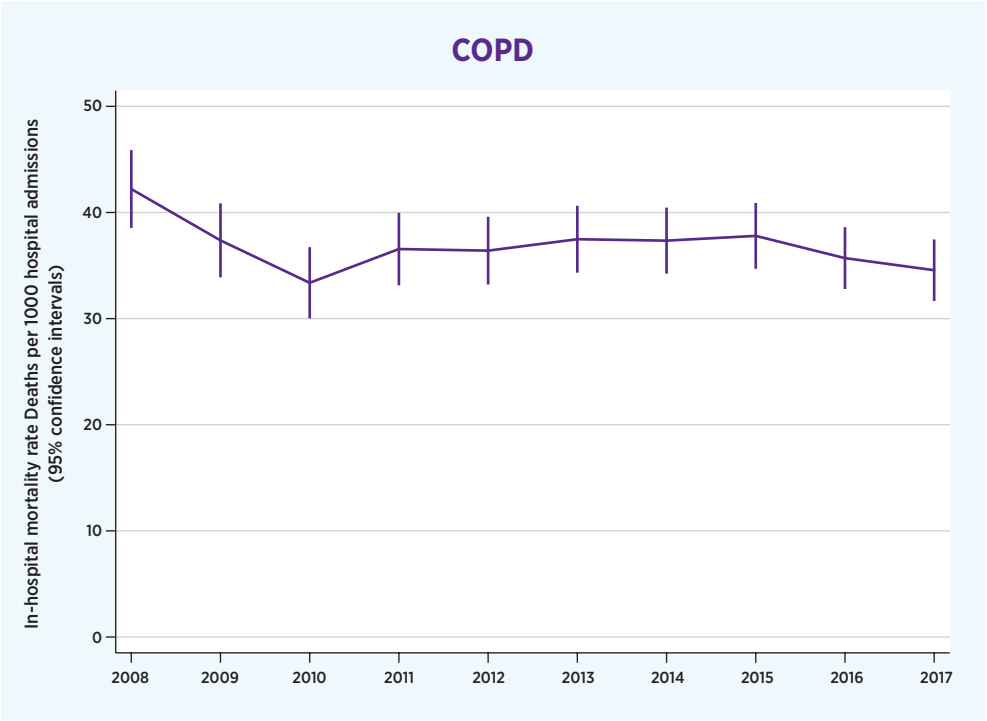


FIGURE 7.1: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF COPD, 2008–2017

- Thirty-two hospitals had more than 100 admitted patients with a principal diagnosis of COPD in 2017; this ranged from 133 to 891 admissions. Figure 7.2 presents the SMR for these hospitals in a funnel plot with 99.8% control limits. Each individual hospital's control limits are calculated based on their patient details.
- The 32 hospitals included in Figure 7.2 represent 98% of all inpatients admitted with a principal diagnosis of COPD in 2017.
- All hospitals had an SMR within the control limits of 99.8% indicating that all hospitals SMR's were within the expected range for 2017.
- Twelve hospitals are not included in this analysis, as they did not meet the selection criterion relating to a defined number of admissions and expected events.

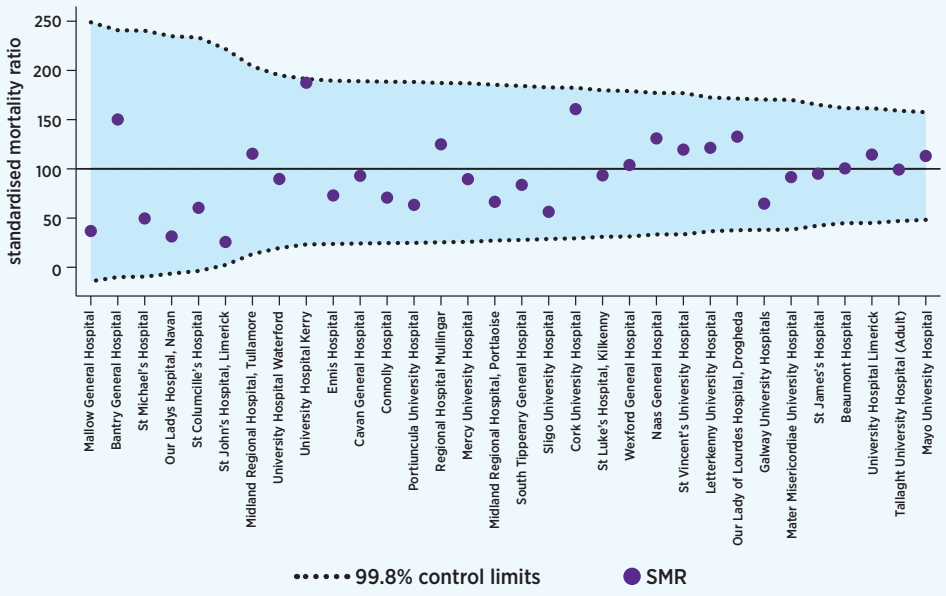


FIGURE 7.2: NATIONAL IN-HOSPITAL SMR FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF COPD, 2017

TABLE 7.1: TABULAR PRESENTATION FOR COPD IN-HOSPITAL MORTALITY, 2017

Hospital Group	Hospital name	No. of admissions for COPD, 2017	SMR -COPD, 2017	99.8% control limits
Dublin Midlands Hospital Group	Naas General Hospital	409	131	(33–177)
	Midland Regional Hospital, Portlaoise	327	67	(27–185)
	St James's Hospital	791	95	(42–165)
	Tallaght University Hospital (Adult)	891	99	(47–159)
	Midland Regional Hospital, Tullamore	401	115	(13–204)
Ireland East Hospital Group	St Columcille's Hospital	241	60	(-4–233)
	Mater Misericordiae University Hospital	805	92	(38–170)
	Regional Hospital Mullingar	426	125	(25–187)
	Our Ladys Hospital, Navan	272	31	(-6–235)
	St Luke's Hospital, Kilkenny	507	93	(31–180)
	St Michael's Hospital	176	50	(-10–240)
	St Vincent's University Hospital	418	120	(33–177)
	Wexford General Hospital	658	104	(31–179)
RCSI Hospitals	Connolly Hospital	493	71	(25–189)
	Beaumont Hospital	745	100	(45–162)
	Cavan General Hospital	458	93	(24–189)
	Our Lady of Lourdes Hospital, Drogheda	582	133	(38–171)
Saolta University Health Care Group	Portiuncula University Hospital	341	63	(25–188)
	Galway University Hospitals	612	65	(38–170)
	Letterkenny University Hospital	632	121	(37–172)
	Mayo University Hospital	588	113	(48–158)
	Sligo University Hospital	432	56	(29–183)
South / South West Hospital Group	Bantry General Hospital	133	150	(-10–241)
	Cork University Hospital	648	161	(29–182)
	University Hospital Kerry	283	187	(23–191)
	Mallow General Hospital	270	37	(-14–249)
	Mercy University Hospital	507	90	(26–187)
	South Tipperary General Hospital	407	84	(28–184)
	University Hospital Waterford	338	90	(20–195)
UL Hospital Group	University Hospital Limerick	675	115	(45–162)
	Ennis Hospital	265	73	(24–190)
	St John's Hospital, Limerick	305	26	(2–222)

Providing leadership for improvement: HSE National Clinical Programme for COPD

The OECD reported that Ireland had the highest age-sex standardised hospitalisation rate for COPD among its members in 2015 (Department of Health, 2018). The National Clinical Programme for COPD aims to reduce COPD admissions by 1,500 per year. However, it is noted that not all hospitalisations due to COPD are avoidable, and many may be clinically appropriate (Department of Health, 2018).

The HSE Clinical Strategy and Programmes Division is sponsoring a national quality improvement collaborative focusing on COPD. This aims to reduce the number of acute patients presenting to emergency departments, improve time to receipt of acute clinical interventions, and lessen avoidable admissions and readmissions. This collaborative has been piloted in two hospitals, and improvements observed have been shorter length of stay, improved patient experience, and integration of services into the community (Royal College of Physicians of Ireland, 2018).

CHAPTER 7

PNEUMONIA

Introduction

Pneumonia is a lung infection which can develop in a previously healthy person or as a complication of other serious health conditions, including post-surgery or post-injury if a person is unable to breathe or cough fully. The very young and very old, and those with another serious health condition, are more likely to require hospital treatment. Pneumonias are caused by a variety of infectious agents, including both bacteria and viruses.

There are several classifications for pneumonia. The measure presented here is the SMR for all pneumonia classifications, which is fully defined in Appendix 10.

Findings:

A crude in-hospital mortality rate from 2008 to 2017 for pneumonia is presented in Figure 7.3, with a 95% CI. These data have not been adjusted for differences in age profile or comorbidities over time, but they provide background information to hospital presentations for this time period. This shows a small but significant reduction (17%) in in-hospital mortality over 10 years, from 14.1 deaths per 100 admissions in 2008 to 11.7 deaths per 100 admissions in 2017.

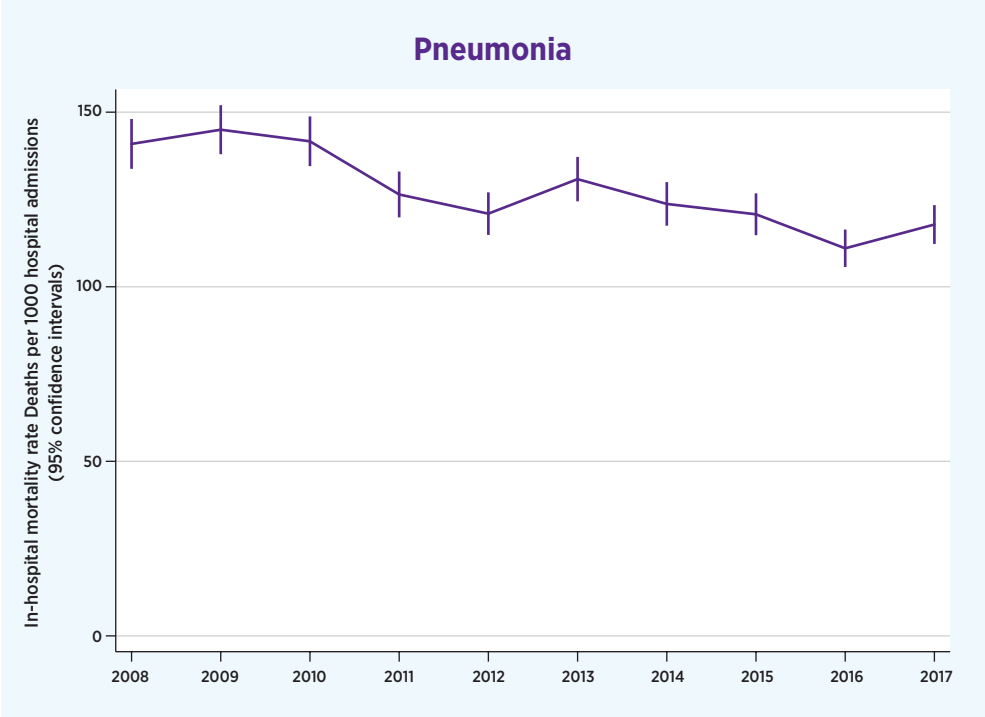


FIGURE 7.3: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF PNEUMONIA, 2008–2017

- Thirty hospitals had more than 100 admitted patients with a principal diagnosis of pneumonia in 2017; this ranged from 107 to 826 admissions. Figure 7.4 presents the SMR for these hospitals in a funnel plot with 99.8% control limits. Each individual hospital's control limits are calculated based on their patient details.
- The 30 hospitals included in Figure 7.4 represent 94% of all inpatients admitted with a principal diagnosis of pneumonia in 2017.
- All hospitals had an SMR within the control limits of 99.8% indicating that all hospitals SMR's were within the expected range for 2017.
- Fourteen hospitals are not included in this analysis, as they did not meet the selection criterion relating to a defined number of admissions and expected events.

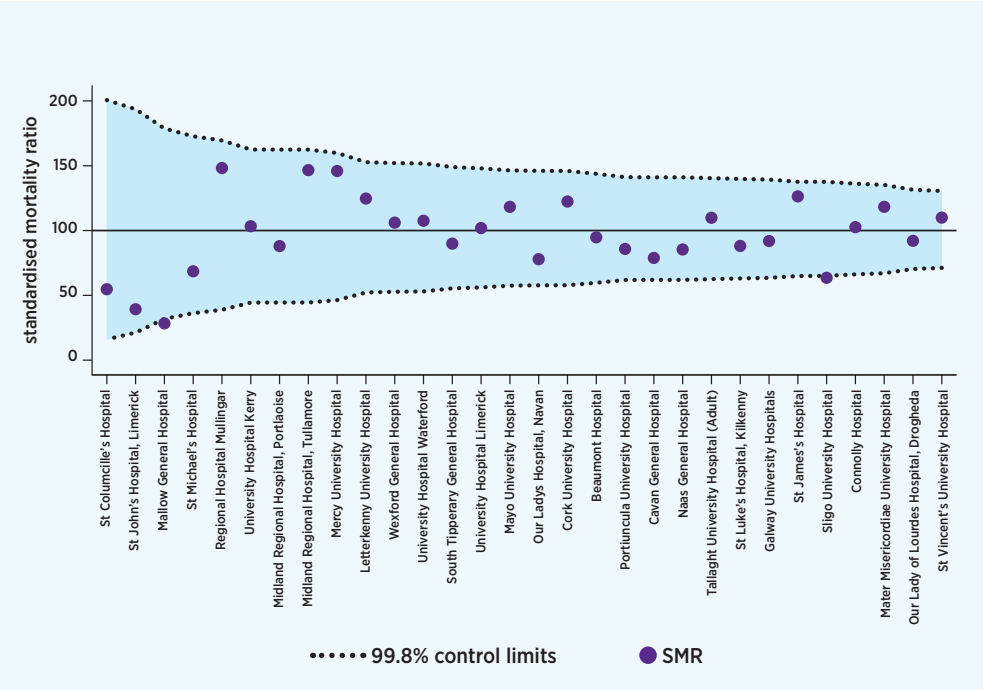


FIGURE 7.4: NATIONAL IN-HOSPITAL SMR FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF PNEUMONIA, 2017

TABLE 7.2: TABULAR PRESENTATION FOR PNEUMONIA IN-HOSPITAL MORTALITY, 2017

Hospital Group	Hospital name	No. of admissions for pneumonia, 2017	SMR – pneumonia, 2017	99.8% control limits
Dublin Midlands Hospital Group	Naas General Hospital	419	85	(62–141)
	Midland Regional Hospital, Portlaoise	236	88	(44–162)
	St James's Hospital	604	126	(65–138)
	Tallaght University Hospital (Adult)	488	110	(63–140)
	Midland Regional Hospital, Tullamore	225	147	(44–162)
Ireland East Hospital Group	St Columcille's Hospital	107	55	(16–201)
	Mater Misericordiae University Hospital	721	118	(67–135)
	Regional Hospital Mullingar	174	148	(39–170)
	Our Ladys Hospital, Navan	375	78	(58–146)
	St Luke's Hospital, Kilkenny	537	88	(63–140)
	St Michael's Hospital	174	69	(36–173)
	St Vincent's University Hospital	759	110	(71–131)
	Wexford General Hospital	406	106	(53–152)
RCSI Hospitals	Connolly Hospital	577	103	(66–136)
	Beaumont Hospital	471	95	(60–144)
	Cavan General Hospital	457	79	(62–141)
	Our Lady of Lourdes Hospital, Drogheda	826	92	(70–131)
Saolta University Health Care Group	Portiuncula University Hospital	432	86	(62–141)
	Galway University Hospitals	538	92	(64–139)
	Letterkenny University Hospital	313	125	(52–153)
	Mayo University Hospital	381	118	(57–146)
	Sligo University Hospital	571	64	(65–138)
South / South West Hospital Group	Cork University Hospital	475	122	(58–146)
	University Hospital Kerry	277	103	(44–162)
	Mallow General Hospital	180	28	(32–179)
	Mercy University Hospital	300	146	(46–160)
	South Tipperary General Hospital	309	90	(55–149)
	University Hospital Waterford	301	108	(53–152)
UL Hospital Group	University Hospital Limerick	416	102	(56–148)
	St John's Hospital, Limerick	110	39	(21–194)

Providing leadership for improvement: HSE National Acute Medicine Programme

The HSE National Acute Medicine Programme continues to work to ensure that all acute medical patients have a better patient experience, with improved communication and receiving safe, quality care, a timely diagnosis, and the correct treatment in an appropriate environment. This work is ongoing.

ACUTE LOWER RESPIRATORY INFECTION (UNSPECIFIED)

Figure 7.5 presents acute lower respiratory infection (unspecified) (ICD-10-AM J22) as a percentage of all respiratory diagnoses in HIPE (ICD-10-AM J00 to J99). Respiratory codes cover a wide range of conditions, such as influenza, cystic fibrosis, asthma, pneumonia, and COPD. In 2017, there were 69,116 admitted patients with a principal diagnosis of a respiratory condition; 20% (n=13,621) of these patients had acute lower respiratory infection (unspecified) documented as their principal diagnosis. This pattern has been consistent over the past five years. Because this is an unspecified diagnosis, the continued levels of use should be reviewed at hospital level.

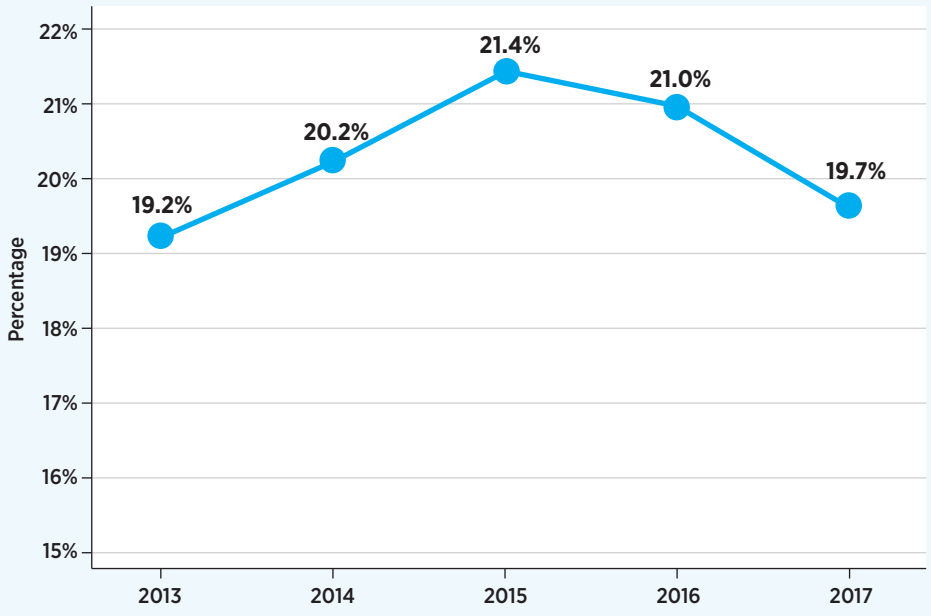


FIGURE 7.5: ACUTE LOWER RESPIRATORY INFECTION (UNSPECIFIED) AS A PERCENTAGE OF ALL RESPIRATORY CODES (J00–J99), 2013–2017

KEY RECOMMENDATION

- **Hospitals should review cases with a principal diagnosis of acute lower respiratory infection (unspecified) in order to ensure that this is an accurate diagnosis. Clinicians should use consistent and specific terminology when documenting respiratory diagnoses.**

In internationally used Clinical Classifications Software (CCS) groups, 'acute lower respiratory infection (unspecified)' (ICD-10-AM J22), is found within the 'acute bronchitis' CCS group. An analysis of cases carried out by HIU for NAHM Analysis and Display Scientific Team (ADST) shows that an overwhelming majority of all hospitals' admissions in the 'acute bronchitis' CCS group have a principal diagnosis of acute lower respiratory infection (unspecified) (ICD-10-AM J22), which is not the same clinical diagnosis as acute bronchitis. The NAHM Governance Committee accepts the recommendation of the ADST to change the name of the CCS group to 'acute lower respiratory infection (unspecified)'.

KEY RECOMMENDATION

- **The 'acute bronchitis' CCS group in NAHM should be renamed as 'acute lower respiratory infection (unspecified)' in order to reflect the majority of the cases it includes.**

CHAPTER 8
BUILDING ON PROGRESS

CHAPTER 8

ENHANCEMENT OF NQAIS NAHM WEB-BASED TOOL

The NQAIS NAHM web-based tool was enhanced in 2018 to improve its functionality and data-access capability, and to make it more user friendly. The NAHM ADST continually reviews the NQAIS NAHM system to ensure that it is aligned with international developments in mortality methodology and new findings.

The HIU, in partnership with NOCA and the software developer OpenApp, identified a range of analytical and display concepts, initially deployed in other NQAIS tools, which could be adopted and adapted in NQAIS NAHM. These enhancements enable hospitals to review their mortality patterns in a more user-friendly and sophisticated way. The enhancements were endorsed by the NAHM Governance Committee. Funding for the enhancements was provided via Health Atlas Ireland capital funding as negotiated by the HIU and NOCA, supported by the OoCIO, and approved by the Department of Public Expenditure and Reform.

The application was successful and implementation began in early 2018. The new system is similar to other NQAIS tools, with a revised style to the menu bars, drop-down menus and table views throughout. This assists in cross-training and in the day-to-day usage of NQAIS applications by the same teams in hospitals. This new-look tool will be referred to as NAHM II.

Timelines

Key dates for the enhancements to the current NQAIS NAHM tool can be seen in Table 8.1. Training on the new NAHM II system will be provided for users and support documentation will be available online.

TABLE 8.1: TIMELINES FOR NAHM II

Action	Date(s)
Completion of enhancements	Q3 2018
User-applied testing	Q4 2018
Implementation of NAHM II	Q4 2018

USER INTERFACE AND APPEARANCE CHANGES

SMR changes since last update

A method has been developed for hospitals to view where an SMR band has changed from the previous update on the grid view (front page). This helps both the hospital and NOCA to quickly and easily identify changes to the SMR as a result of new data. As this is shown on the grid view, it is available at the all diagnoses, CCS group, and diagnosis levels at a glance. Figure 8.1 shows a sample screen illustrating arrows for a change in band; for example, a yellow (above average) upwards arrow indicates that the SMR has changed from white (average) at the last update.

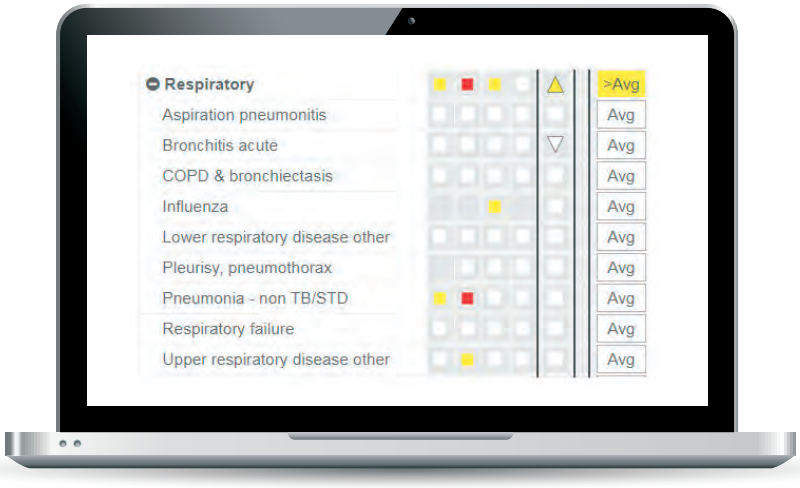


FIGURE 8.1: ILLUSTRATION OF SMR CHANGES SINCE LAST UPDATE

Summary view

Figure 8.2 shows a snapshot of NAHM II summary view which presents top-level values and CuSum signals for the selected dates and ranges. The view can be tailored as required in order to show all activity or specific diagnosis groups. The view is presented in three sections:

1. Key top-level values, which provide contextual framework.
2. SMR and CuSum signals, which are presented in graphics. These are shown for the last 12 months, the latest complete year, and the last three years. The value of the SMR and the number of CuSum signals are shown in columns.
3. CuSum signals over the last rolling 12-month period shows the diagnosis, signal type, and date the signal appeared. There is an option to sort the findings as required.

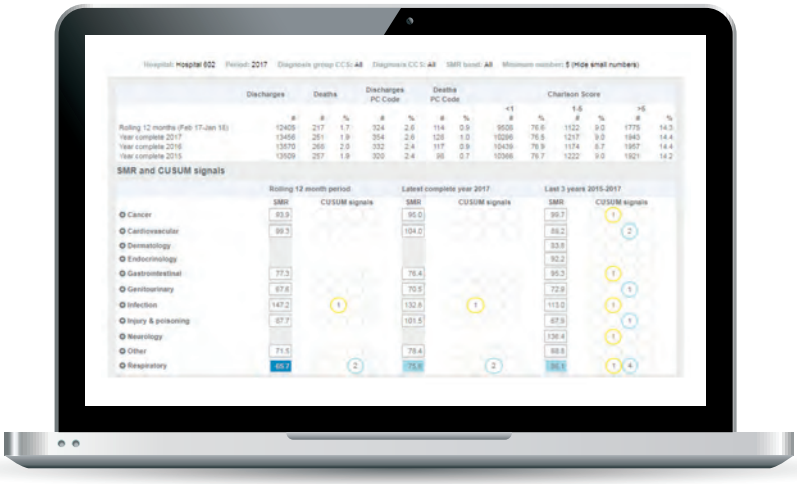


FIGURE 8.2: ILLUSTRATION OF SUMMARY VIEW (USING RANDOM DATA)

Bookmark

This feature allows a user to save a selection within the last 12 months data to be retrieved repeatedly. Users will no longer have to try to remember the steps taken to reach a certain set of records within a diagnosis or date selection; they can simply bookmark it before logging out and it can be recalled at any time in the future.

'Look back'

This is the addition of a 'library' of historical updates stored in chronological order. The purpose of this function is to allow users to access older updates so they can revisit previous 'last 12 months' data updates (in order to understand how a change in a particular signal of interest occurred). This is especially valuable if a user has been working on a signal and has not bookmarked their work before a new update of data occurred which caused signals to change.

Plots

The purpose of this new view is to display thumbnail plots for all diagnoses in the selection chosen by the user, such as an SMR trend plot, an SMR diamond plot, a funnel plot, CuSum, discharges, palliative care code, and key values. Clicking on the thumbnail will expand to a display screen with greater detail. The expanded view includes the explorer function as described below.

Explorer

The introduction of explorer in NAHM II provides users with an interactive view of their data. This is a graphical tool enabling the dynamic on-screen review of patient profiles under various headings. Figure 8.3 shows headings available for interactive analysis.

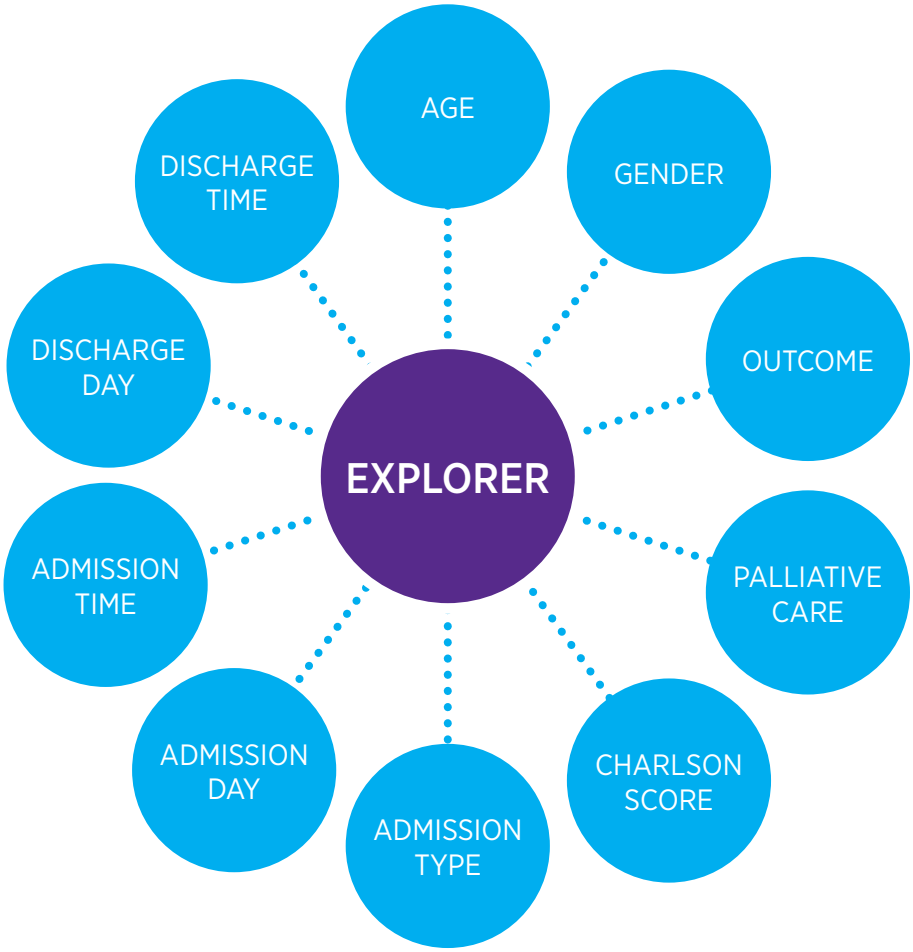


FIGURE 8.3: EXPLORER HEADINGS IN NAHM II

Any of the parameters identified within a heading can be clicked in order to select or deselect that parameter or part thereof. For example, within the 'Gender' pictogram a user can click on the 'Female' bar, and then the pictograms for the other headings change according to this selection to show the values for females only.

CuSum flatline view

Figure 8.4 shows a sample of a CuSum chart in NAHM II which has been enhanced to display in a flatline format with CuSum signals appearing as circles where control limits are breached. All CuSums on SMR bands are now displayed below the chart, whereas previously only the high signals were shown. Modifications have been made to date range selection, allowing users to input specific dates of interest, resulting in more accurate data.

FIGURE 8.3: ILLUSTRATION OF FLAT LINE CUSUM (USING RANDOM DATA)

Record selection

The options within record selection have been expanded in order to allow users to include a broader range of HIPE categories so that a pattern of interest can be explored as fully as possible. This makes a desktop exercise more in-depth, and therefore makes it easier for users to identify when a chart review may be necessary.

Pre-prepared hospital reports

In consultation with three hospital users, the report function in NAHM II has been expanded in order to provide data relevant for hospital managers and for Quality and Safety Committees. Reports are pre-prepared and generated with each new data update. Hospitals and hospital groups can select the reports they require from a drop-down menu, either for all diagnoses or for a particular CCS group. For example, if the 'respiratory' CCS group is selected, the report will include information for the diagnoses listed in Figure 8.5 (if patients have one of the conditions assigned as a principal diagnosis and there were more than five expected/observed deaths in the 12-month period being examined).

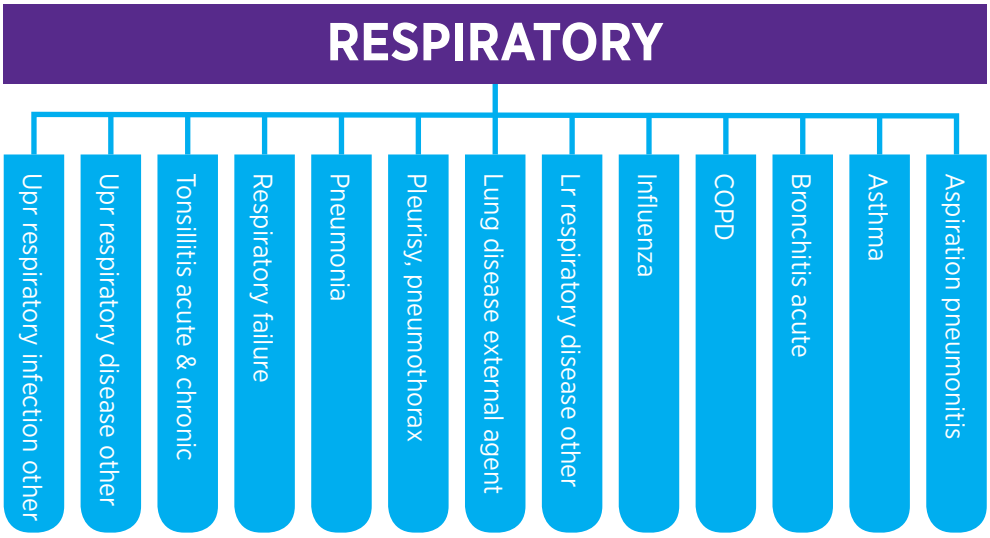


FIGURE 8.5: EXAMPLE OF CONDITIONS INCLUDED IN CCS GROUP REPORTS

The pre-prepared hospital report will contain the following:

- A title page detailing its content, date produced, etc.
- A summary page (top-level values, SMR and CuSum signals, and CuSum signal type and date)
- An expanded plots view page (SMR diamond, SMR trends, funnel plot, CuSum, and key values).

Technical changes

A number of technical changes to the model have also been incorporated into the enhancements. Some examples of where changes have been made are as follows:

- Charlson Comorbidity Index (CCI) scoring available in the explorer page
- Freezing of old years to prevent recalculation when 'look back' is viewed
- CuSum flatline, to assist interpretation of signals
- Audit trail, to show use of the system
- Extended availability to view pages in PDF/Excel/JPEG format
- Extended number of three-year combinations
- Increased expansion functions
- Introduction of new cross-tabulation tool.

The clinical management of the patient remains at the forefront of NAHM but this has also proven to be of enormous value to hospital managers. With these and other developments, it is hoped that NQAIS NAHM will continue to be a powerful, useful and accessible tool for monitoring mortality within Irish hospitals.

TABLE 8.2: UPDATE ON RECOMMENDATIONS FROM NAHM

Recommendation	Key development leads	Summary progress update	Accountable for implementation	Status
Continued and increased collaboration between clinicians and clinical coders will improve the quality of the recording and coding of hospital data.	HPO, NOCA	Recommendation accepted. NOCA working with the HPO and stakeholders to develop promotional campaign to develop key principles for good healthcare information	Hospitals Hospital Groups	On hold pending confirmation of owner
NAHM should be used by clinicians, hospital managers and their Boards as a quality improvement tool for the targeted review of hospital mortality patterns.	NOCA, HSE Acute Operations	A governance checklist which can be used for quality assurance purposes by hospitals is complete and available from the NOCA website. HSE Acute Operations will support implementation through informing hospitals and performance monitoring.	Hospitals, hospital groups, hospital boards	In progress
NAHM should be integrated within the hospital and hospital group governance structures. This should also involve clinical teams.			Hospitals, Hospital Groups	
Hospitals will prospectively use NQAIS NAHM.				
Guidance aimed at clinical coders is required from both the HSE National Clinical Programme for Palliative Care (on interpretation of clinical documentation) and from the HPO (on use of the palliative care code).	HSE, HPO	The National Clinical Programme for Palliative Care is working with the HPO to develop guidance on the interpretation of palliative care code documentation to be included in coder training. New guidance to be introduced in January 2020. See Chapter 5: Data quality for NAHM, page 45	Hospitals Hospital Groups	In progress
The NAHM Governance Committee should commission a short life working group with the HSE National Clinical Programme for Palliative Care and the HPO to examine the possibility of including a palliative care specialty clinical code in NQAIS NAHM.	NOCA, HPO	Not technically possible, due to constraints of the coding system. See Chapter 5: Data quality for the NAHM, page 45	N/A	Closed
The NAHM Governance Committee should commission a research study to investigate the changes in hospital admissions and crude mortality rates in key diagnoses presented in this report.	NOCA	Research ongoing into objectives and factors influencing reported mortality rates.	N/A	In progress
The NAHM Governance Committee, working with international experts, should examine a process to enable the validation of NAHM data following closure of the HIPE file	NOCA	Recommendation from the NQAIS NAHM ADST to the NAHM Governance Committee: amendment of data is not possible once HIPE is closed. Process to allow hospitals to view their data monthly to ensure appropriate actions are taken in local HIPE files has been put in place. See Chapter 5: Data quality for the NAHM, page 46.	NOCA	Closed
The possibility of an illness severity score within the NQAIS NAHM tool should be explored by the NAHM Governance Committee.	NOCA	Recommendation from the NQAIS NAHM ADST to the NAHM Governance Committee: it is not feasible to incorporate an illness severity score in the NQAIS NAHM.	N/A	Closed

Update on recommendations 2016

The NAHM Governance Committee should commission a research study to investigate the changes in hospital admissions and crude mortality rates in key diagnoses presented in this report.

Dr Jan Sorenson, Health Outcomes Research Centre, Royal College of Surgeons in Ireland, is researching factors influencing reported mortality rates. When completed, this research will be presented to the NAHM Governance Committee, followed by a published paper.

The possibility of an illness severity score within the NQAIS NAHM tool should be explored by the NAHM Governance Committee.

This was reviewed and considered by the NAHM ADST, who advised that there is no means within HIPE to view or assess the severity of a diagnosis (either principal or additional). The severity of conditions should be assessed using clinical judgement, and this subjective view cannot be included as part of HIPE; therefore, it is not possible to factor severity into the NQAIS NAHM model.

The General Data Protection Regulation (GDPR) and NAHM

The General Data Protection Regulation (GDPR) was introduced in Ireland on 25 May 2018. This is a set of data protection laws and guidelines aimed at the collection and processing of personal information on people residing in the EU.

Within NOCA, the security and protection of audit data is a priority. Assurances are in place on how data are collected, processed and stored across all audits. NOCA is committed to protecting the confidentiality of all personal and health data gathered for audit, and has developed appropriate technical and organisational measures to ensure that this occurs. NOCA uses standard industry operating procedures and internal policies in order to ensure that data remain secure, with continual monitoring to improve the security of all hosting and storage infrastructure used to store data.

In NQAIS NAHM, pseudonymised data are used therefore NOCA cannot identify patients in any way. Encrypted medical record number (MRN)s are available to local hospitals that can decrypt their MRNs in their hospital's HIPE office. NOCA applies the principles and protections of the GDPR to all data regardless of the status of any individual patient (alive or deceased). All data are important, and NOCA adheres to standards and uses data appropriately as per the agreed objectives of NAHM.

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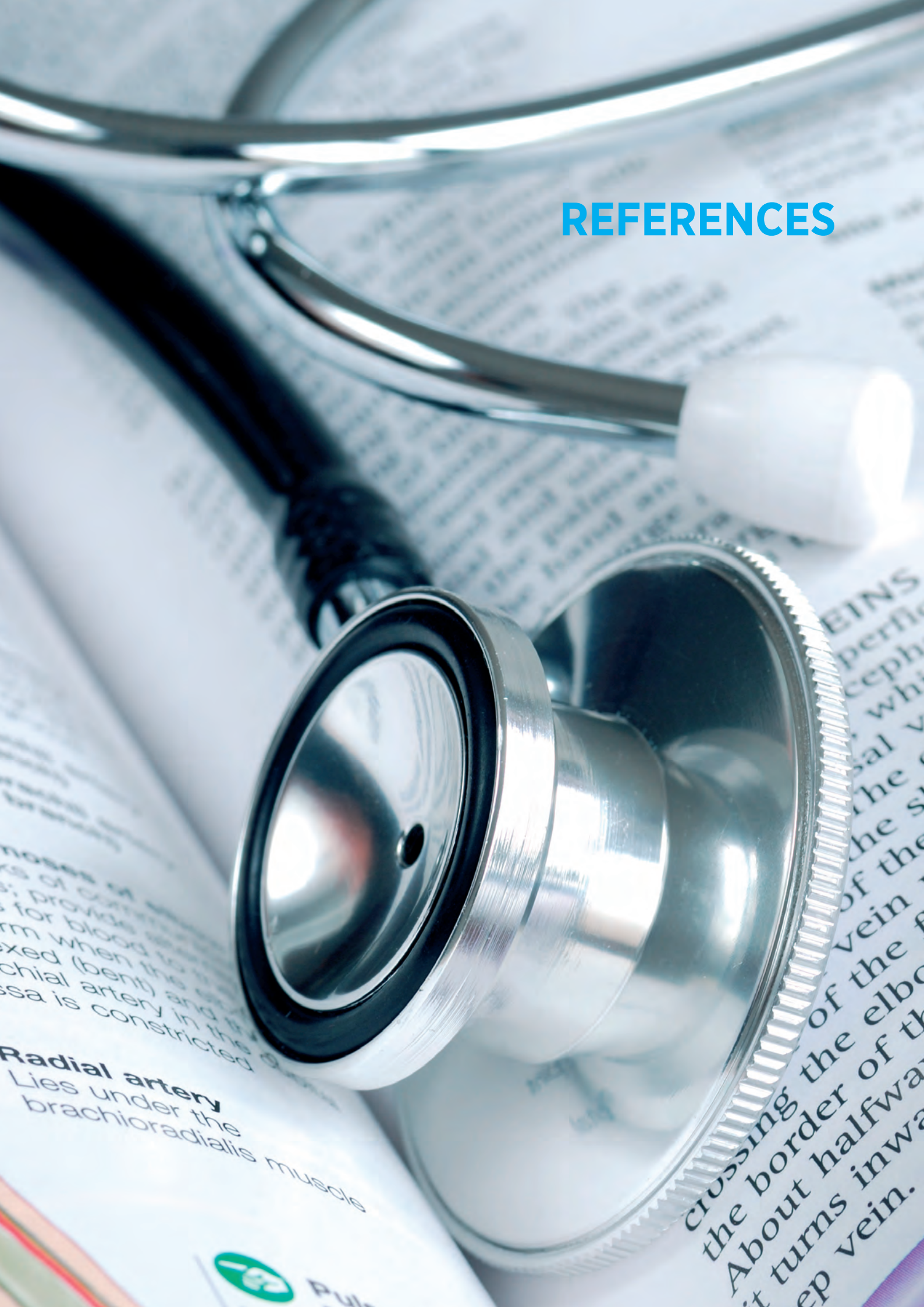

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APPENDICES

APPENDIX 1: NAHM GOVERNANCE STRUCTURE

NAHM is deployed under the governance framework of NOCA. The NOCA Governance Board guides NOCA's clinical decision-making and strategic direction, and it provides oversight for five national clinical audits.

- NOCA has established a NAHM Governance Committee with multidisciplinary membership, including clinical and executive leadership from Irish hospitals and the health service. The NAHM Governance Committee oversees two subcommittees and the NOCA Operational Team.
- In consultation with the HIU, NOCA has developed the NQAIS NAHM Analysis and Display Scientific Team (ADST). This team provides specialist expertise in order to achieve excellence in the development and enhancement of the NQAIS NAHM web-based tool. The membership of the team comes from the HIU, NOCA, the NAHM Governance Committee and the software developer. This aligns NQAIS NAHM with developments on other NQAIS projects under the HIU umbrella.
- The NAHM Writing Group is a subcommittee of the NAHM Governance Committee that is convened specifically to write the annual report.
- The NAHM Operational Team oversees the day-to-day management of NAHM in line with NOCA policies and guidelines.

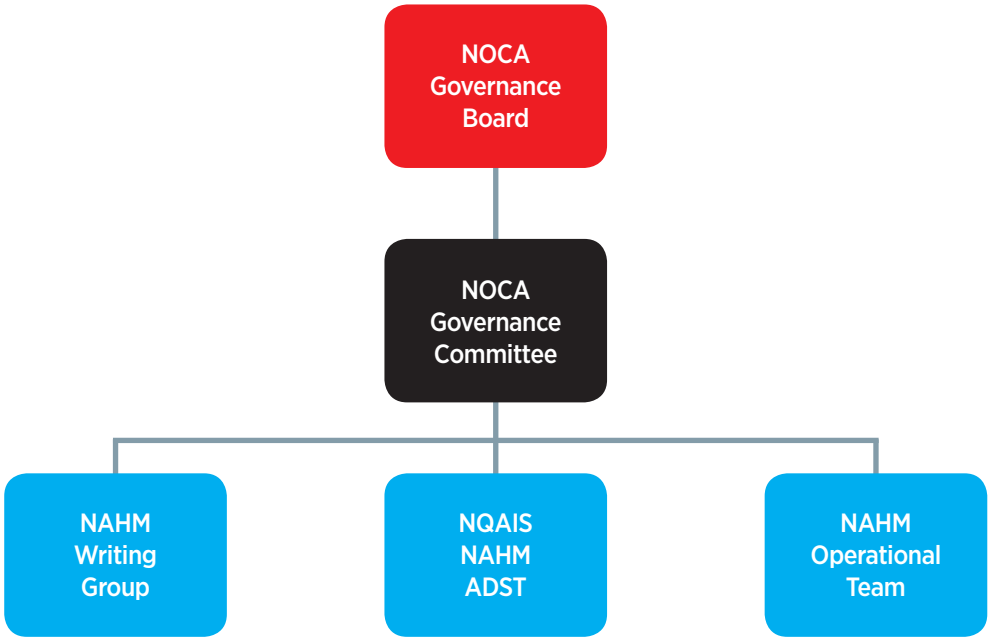

FIGURE A1.1: NAHM GOVERNANCE STRUCTURE

TABLE A1.1: ATTENDANCE AT NAHM GOVERNANCE COMMITTEE MEETINGS IN 2017

Name	Role/Representing Body	31 Jan 2017	26 April 2017	3 Oct 2017	7 Nov 2017
Dr Brian Creedon, Chair	Royal College of Physicians in Ireland	✓	✓	✓	✓
Margaret Brennan	HSE Acute Hospitals Division		✓	[3]	✓
Dr Rory Dwyer[1]	Joint Faculty of Intensive Care Medicine of Ireland	✓		N/A	N/A
Prof Richard Costello[1]	Royal College of Physicians of Ireland		N/A	N/A	N/A
Alan Egan[2]	Public Representative	N/A	N/A	N/A	✓
Ms. Bridget Egan	Royal College of Surgeons in Ireland		✓	✓	
Eilísh Hardiman	Hospital Group CEO Forum	✓			
Dr Howard Johnson	HSE Health intelligence Unit, Strategic Planning and Transformation	✓		✓	✓
Prof Simon Jones	International Expert			✓	✓
Dr Niall Mahon[1]	Royal College of Physicians of Ireland		✓		
Dr Jennifer Martin	HSE Quality Improvement Division	✓	✓		
Dr Kathleen McGarry	Royal College of Physicians of Ireland	✓	✓	✓	✓
Dr Ed McKone[2]	Royal College of Physicians of Ireland	N/A	✓	✓	
Dr Jeanne Moriarty[2]	Joint Faculty of Intensive Care Medicine of Ireland	N/A	N/A	✓	
Deirdre Murphy	HSE Healthcare Pricing Office	✓	✓	✓	✓
Brian O'Mahony	Public Representative				
Dr Ellen O'Sullivan[1]	The College of Anaesthetists of Ireland				
Dr Geraldine Shaw	HSE Office of the Nursing and Midwifery	✓	✓		✓
Dr Barry White	Royal College of Physicians of Ireland		✓	✓	
Deirdre Burke	In attendance: NOCA	✓	✓	✓	✓
Marina Cronin	In attendance: NOCA	✓	✓	✓	✓

1 Resigned from the NAHM Governance Committee
2 Joined the NAHM Governance Committee in 2017
3 Proxy attended
N/A Representative was not yet appointed to or had resigned from the NAHM Governance Committee at the time of the meeting date stated above

APPENDIX 2: METHODOLOGY FOR MEASURING IN-HOSPITAL MORTALITY

MORTALITY RATES

Introduction

In-hospital mortality (death) rates measure the number of deaths as a proportion of the number of hospital admissions. Differences in mortality findings between hospitals can be due to one or more of the following:

- Expected variation: Due to the nature of data, there will always be some fluctuation in the precise measure between one reporting period and the next.
- Differences in patient factors: Patients differ from one another in terms of age, gender and comorbidities.
- Differences in data collection: Hospitals and healthcare providers may differ in terms of how a patient's medical chart is completed or how conditions are recorded and coded.
- Differences in quality of care: Mortality is one measure of the quality of care provided to patients in hospital.

There are a number of approaches to measuring mortality rates. Each varies; they are calculated in different ways and used for different purposes. The three main approaches are:

1. Crude in-hospital mortality rate
2. Directly standardised in-hospital mortality rate
3. Indirectly standardised in-hospital mortality ratio.

1. Crude in-hospital mortality rate

The crude in-hospital mortality rate is a measure of the number of deaths per 100 admissions. It is important to remember that it does not attempt to adjust for differences in patient populations (such as age and comorbidity; see above). It is usually presented with reference to a specific disease, such as stroke or acute myocardial infarction (AMI). It is typically expressed as the number of deaths per 100 of the total number of admissions for that specific condition per year.

$$\textbf{Crude in-hospital mortality rate} = \frac{\text{No. of deaths*}}{\text{Total admissions *}} \times 100 \text{ per year}$$

*For that specific diagnosis

The crude in-hospital mortality rate gives an overview of the extent to which a given condition adds to the overall burden from death in a particular hospital or group of hospitals. It is not a standardised measure because it does not take into consideration confounding factors such as age, type of admission, previous admissions or existing background illness (case mix and comorbidity) in a population of patients. This method is useful in that it allows each hospital to take a bird's-eye view of its number of deaths as well as time trends, providing there has been no significant change in case mix during the period in question.

However, that being said, it is not appropriate to compare hospitals against one another using the crude in-hospital mortality rate because it does not take into account any of the other important factors affecting mortality. Crude in-hospital mortality is used in this report to show the national trend.

2. Directly standardised mortality rate

The direct standardisation method provides more adjustment for population differences. Standardisation in this context means that a common age-structured population is used as the standard, and study populations or groups are compared against this. Age and gender are the two most common variables used for direct standardisation, and the national population may be used as the 'standard population' (see Figure A2.1).

(Source Naing, 2000, Figure 1)

FIGURE A2.1: CONCEPT OF DIRECT STANDARDISATION

Standardisation therefore means that the mortality rates produced for a population or condition in a hospital are those that they would have had if they had the same attributes as the standard population. Direct standardisation methods are more powerful when numbers are larger, and are best used for a single or otherwise homogeneous group of diagnoses. It is important to note that only a limited number of variables may be standardised for using this method.

The Organisation for Economic Co-operation and Development (OECD) uses the directly standardised death rate as the basis for its methodological approach (Organisation for Economic Co-operation and Development, 2015). The reference population is based on the age and gender profile of the OECD 2010 population admitted to hospital with selected conditions. This allows direct comparison between OECD member states and is of greatest value when it is used to compare practices across international boundaries. This is the approach used by the Department of Health for the *National Healthcare Quality Reporting System Annual Report* (Department of Health, 2018) for selected diagnoses, specifically AMI, haemorrhagic stroke and ischaemic stroke. Due to the differences in methodology, it is not possible to compare in-hospital mortality indicators in this report against those reported by the Department of Health.

3. Indirectly standardised mortality ratio

The standardised mortality ratio (SMR) is another method that adjusts for population differences. It is a measure of mortality which allows individual hospitals to compare their observed death rate against the rate that would be expected in that hospital if other variables affecting mortality could be taken into consideration.

$$\textbf{Standardised mortality ratio} = \frac{\text{Observed deaths}}{\text{Expected deaths}} \times 100$$

The 'expected' deaths are calculated from national data using statistical techniques to account for differences in patient factors. These factors include: age, deprivation, whether patients were in receipt of palliative care treatment in hospital, number of previous admissions in the past year, source and type of admission (for example, from home or a nursing home or an emergency transfer from another acute hospital), and the CCI (Charlson *et al*., 1987), which is a measure of comorbidity. The CCI assigns a weighting to the degree to which the patient is debilitated by a number of background illnesses and conditions. Therefore, it can be seen that the indirect approach to standardisation allows a greater number of variables to be controlled for, which is very useful in dealing with complex conditions and presentations.

Overall, the SMR is an appropriate way to measure in-hospital mortality in Ireland because:

- There are a large number of hospitals, many of very different sizes.
- It takes account of a larger number of variables, which impact on in-hospital mortality.

SMRs can be presented by individual hospital or by diagnosis group, such as AMI or stroke. They do not allow hospitals to compare outcomes against one another, but they do allow comparison against a national average, which is set at 100.

Control limits

While the national average is set at 100, it is unlikely that any calculated SMR will be exactly 100. A certain amount of variation above or below this average is to be expected as normal, and the control limit approach is a method of accounting for this. Control limits are statistical calculations based on the number of admissions and deaths within each hospital which show the variation that is normally expected to occur in that hospital's data. The control limits are set at 99.8%, meaning that there is a 1-in-500 chance of a hospital being outside these limits by chance alone. This means, therefore, that an SMR which is above (or below) the 99.8% control limits is unlikely to have occurred by chance and may indicate greater (or fewer) deaths than would otherwise be expected.

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APPENDIX 3: SMR FUNNEL PLOT

SMR funnel plot

For this report, SMR funnel plots are scatterplots of individual hospitals SMRs. The upper and lower borders of the funnel are represented by the 99.8% control limits. These borders represent the upper and lower limits of what is referred to as 'expected variation'. The control limits are affected by the number of cases with a principal diagnosis in hospitals. Hospitals with smaller numbers of cases have wider control limits and appear to the left of the SMR funnel plot, while hospitals with larger numbers of cases have narrower control limits and appear to the right of the funnel plot.

An SMR is expected to appear within the 99.8% control limits 998 times out of 1000. Statistically, 1 in 500 observations can be expected to appear outside these control limits by chance alone. In other words, if an SMR appears outside these limits, it is very unlikely that it is there due to chance. These observations represent variation worthy of further review.

Funnel plots make it very easy to identify these observations worthy of further review. The Association of Public Health Observatories (2008) recommend funnel plots as a graphical aid for institutional monitoring. A hospital's SMR should only be compared to its own control limits. There is no basis for ranking institutions into 'league tables' (Spiegalhalter, 2005), therefore it is not valid to directly compare SMRs between hospitals.

SAMPLE NATIONAL FUNNEL PLOT

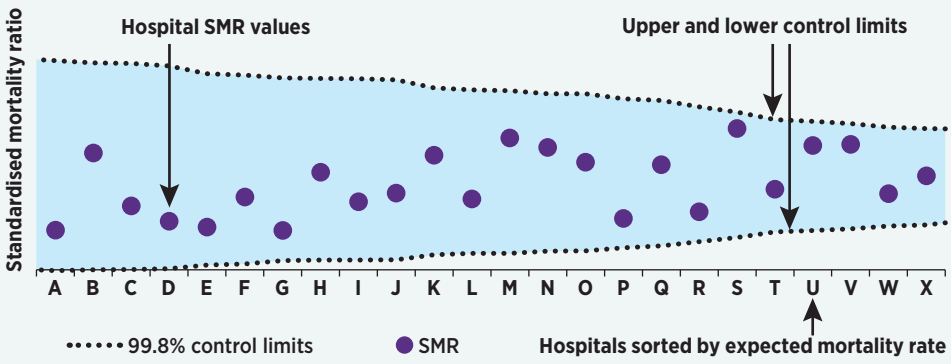

FIGURE A3.1: INFORMATION, FUNNEL PLOT

References:

Association of Public Health Observatories (2008) Technical Briefing 2: Statistical process control methods in public health intelligence [Online]. Available at: http://webarchive.nationalarchives.gov.uk/20170106081156/http://www.apho.org.uk/resource/item.aspx?RID=39445 [Accessed on: 25.09.2017].

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SMR control charts

The SMR control charts for key diagnosis from 2013 to 2017 show three horizontal traces set against the national SMR of 100 (blue line). An SMR of 100 means that the number of observed and expected deaths are exactly the same. The middle, bold trace is the SMR trend, calculated year on year for that key diagnosis and for that hospital. The upper dotted line represents the upper 99.8% confidence limit; the lower dotted line represents the lower 99.8% confidence limit.

If the line SMR=100 appears above or below the dotted confidence limit lines, this means that the SMR in that hospital for that condition is significantly higher (or significantly lower) than expected. It is unusual for that to happen due to chance (probability of 1 in 500). Observations of SMRs outside of the control limits represent variation worthy of further review.

SAMPLE CONTROL CHART FOR INDIVIDUAL HOSPITAL SMR

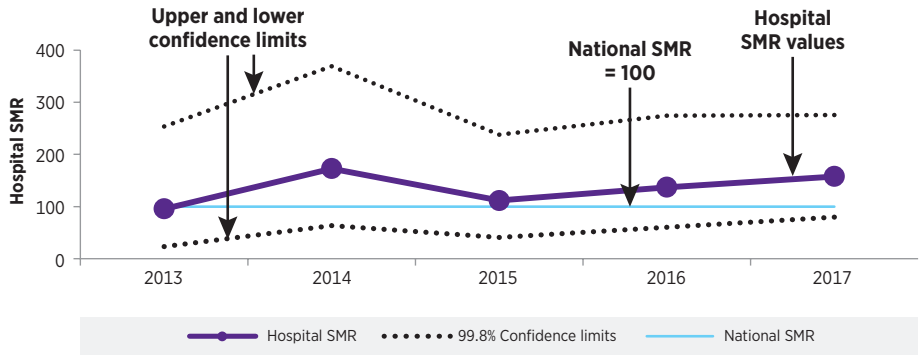

FIGURE A3.2: INFORMATION, INTERPRETATION OF SMR CONTROL CHARTS

APPENDIX 4: CHARLSON COMORBIDITY INDEX

The CCI has been widely used to measure and predict the impact that comorbid diseases have on a patient's survival (Chu *et al*., 2010). The CCI assigns a weighting (score) to 17 comorbidities based on the risk of dying within one year for each one. The scores are added to provide a CCI score. This score is used to predict mortality within a 12-month period (Charlson *et al.*, 1987). The CCI has been modified to include new knowledge and advances in clinical care, as well as the latest version of the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10).

Validation studies have shown a close correlation between assigned CCI scores and subsequent outcome, both in the original weightings and in more recent adjustments to the original scores (Sundarajan *et al.*, 2004; Bottle and Aylin, 2011).

NQAIS NAHM uses the new Health and Social Care Information Centre (HSCIC) weighting, as outlined below (Table A4.1). Within the NQAIS NAHM SMR risk model, and as used by the HSCIC, the CCI score is grouped as follows: <1, 1–5, >5.

TABLE A4.1: NEW AND OLD WEIGHTINGS APPLIED TO CCI CATEGORIES (HSCIC)

	Condition name	ICD-10-AM code(s)	New weight	Old weight
1	Acute myocardial infarction	I21, I22, I23, I252, I258	5	1
2	Cancer	C00–C76, C81–C97	8	2
3	Cancer - metastatic	C77, C78, C79, C80	14	3
4	Cerebral vascular accident	G450, G451, G452, G454, G458, G459, G46, I60–I69	11	1
5	Congestive heart failure	I50	13	1
6	Connective tissue disorder	M05, M060, M063, M069, M32, M332, M34, M353	4	1
7	Dementia	F00, F01, F02, F03, F051	14	1
8	Diabetes	E101, E105, E106, E108, E109, E111, E115, E116, E118, E119, E131, E136, E138, E139, E141, E145, E146, E148, E149	3	1
9	Diabetes complications	E102, E103, E104, E107, E112, E113, E114, E117, E132, E133, E134, E137, E142, E143, E144, E147	-1	2
10	HIV	B20, B21, B22, B23, B24, O987	2	6
11	Liver disease	K702, K703, K717, K73, K74	8	1
12	Liver disease – severe	K721, K729, K766, K767	18	3
13	Paraplegia	G041, G81, G820, G821, G822	1	2
14	Peptic ulcer	K25, K26, K27, K28	9	1
15	Peripheral vascular disease	I71, I739, I790, R02, Z958, Z959	6	1
16	Pulmonary disease	J40–J47, J60–J67	4	1
17	Renal disease	I12, I13, N01, N03, N052–N056, N072–N074, N18, N19, N25	10	2

References:

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APPENDIX 5: ACUTE MYOCARDIAL INFARCTION

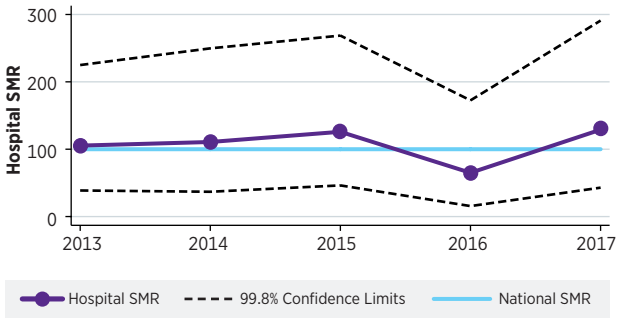
TABLE A5.1: AMI INDICATOR

Definition	Standardised mortality ratio with a principal diagnosis of AMI
Years covered	2017
ICD-10-AM codes	I21, I210, I211, I212, I213, I214, I219, I22, I220, I221, I228, I229
Methodology	**Numerator** Number of actual deaths following admission to hospital with the following ICD-10-AM principal diagnoses: 'Acute myocardial infarction', 'Acute transmural MI of anterior wall', 'Acute transmural MI of inferior wall', 'Acute transmural MI of other sites', 'Acute transmural MI of unspecified site', 'Acute sub-endocardial MI', 'Acute myocardial infarction unspecified', 'Subsequent myocardial infarction', 'Subsequent MI of anterior wall', 'Subsequent MI of inferior wall', 'Subsequent MI of other sites', 'Subsequent MI of unspecified site' **Denominator** Number of expected deaths for AMI. This is calculated using an indirect standardisation and logistic regression modelling of all patients admitted to hospital with a principal diagnosis of AMI.

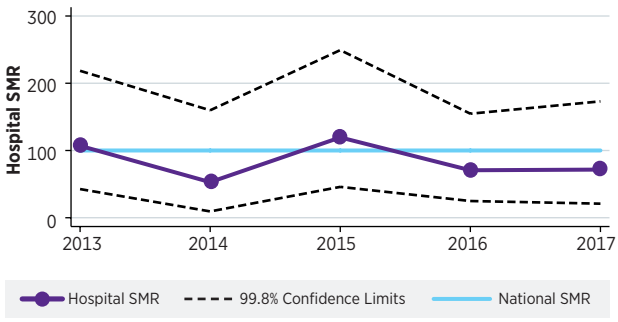
AMI SMR CONTROL CHARTS 2013-2017

FIGURE A5.1 RCSI Hospitals

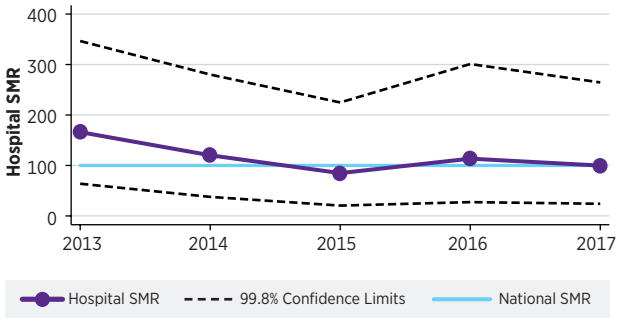
Beaumont Hospital: AMI



Cavan General Hospital: AMI



Connolly Hospital: AMI



Our Lady of Lourdes Hospital, Drogheda: AMI

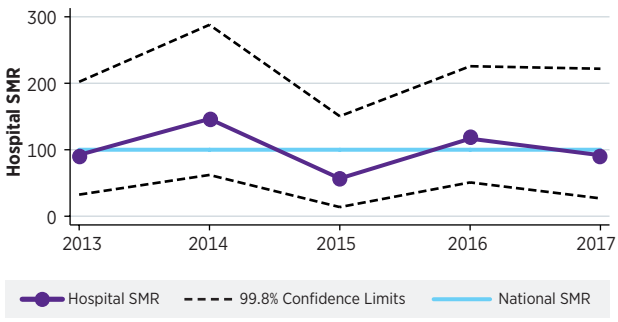
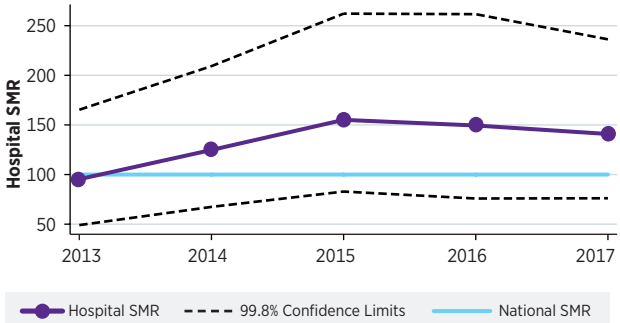
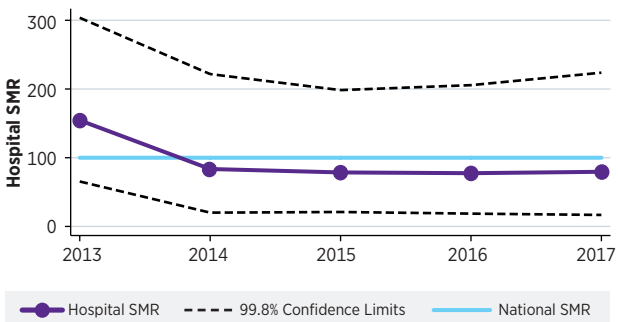


FIGURE A5.2 Ireland East Hospital Group

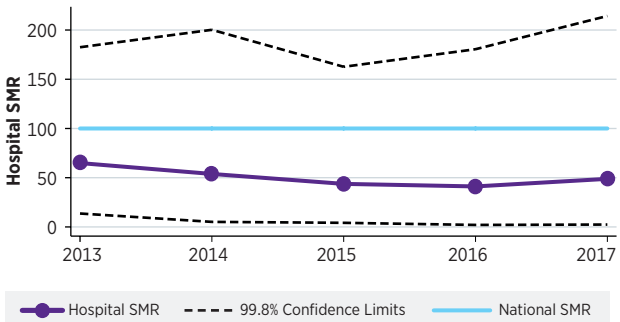
Mater Misericordiae University Hospital: AMI



St Luke's Hospital, Kilkenny: AMI



Our Ladys Hospital, Navan: AMI



St Vincent's University Hospital: AMI

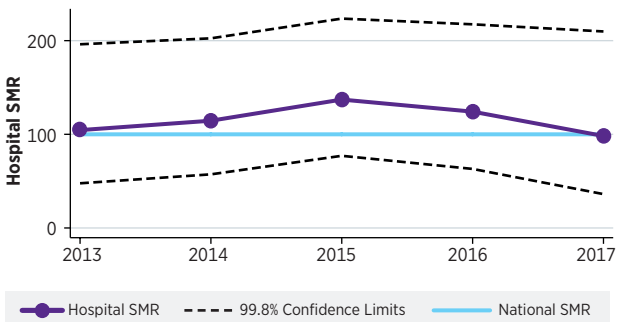
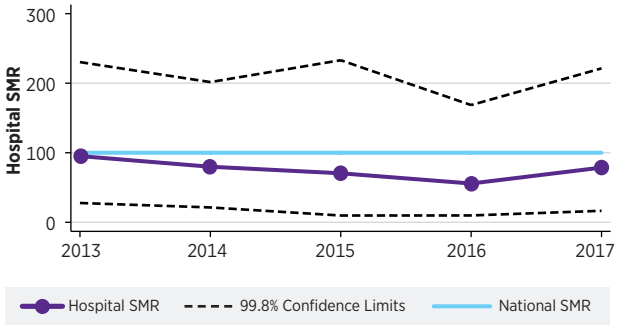


FIGURE A5.2 Ireland East Hospital Group

Wexford General Hospital: AMI



Regional Hospital Mullingar: AMI

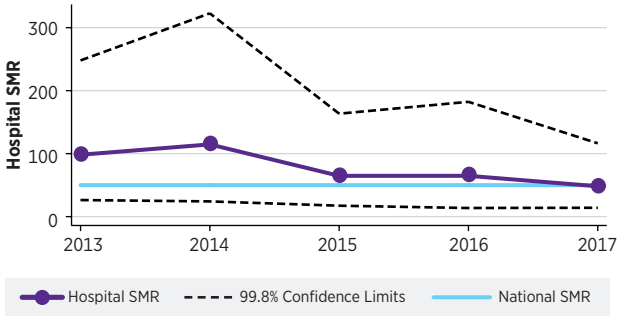
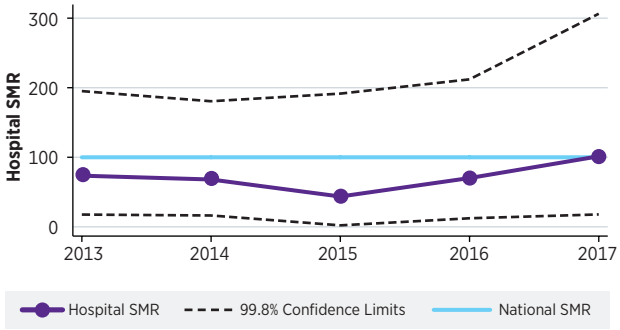
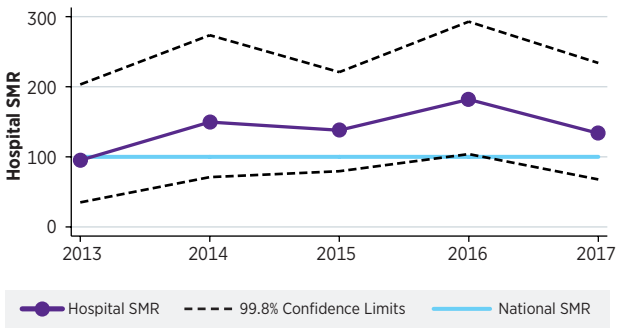


FIGURE A5.3 Dublin Midlands Hospital Group

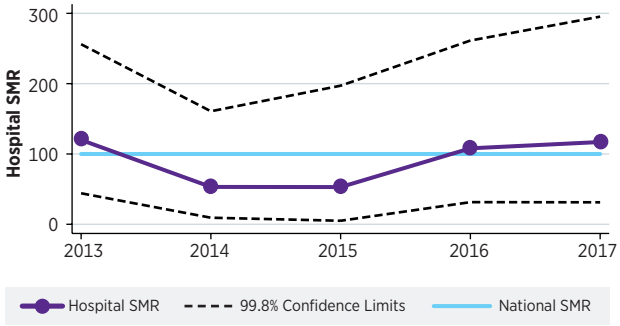
Naas General Hospital: AMI



St James's Hospital: AMI



Tallaght University Hospital (Adult): AMI



Midland Regional Hospital, Portlaoise: AMI

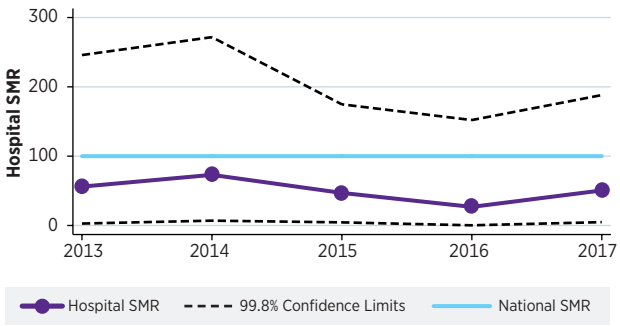


FIGURE A5.4 UL Hospital Group

University Hospital Limerick: AMI

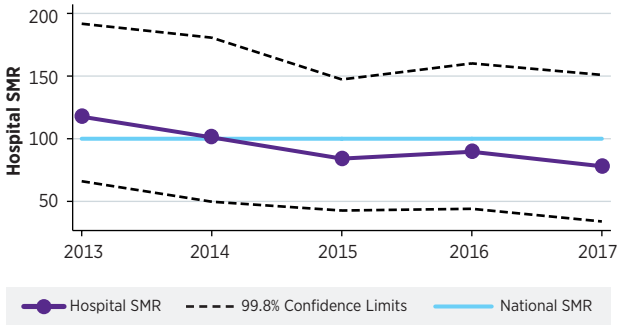
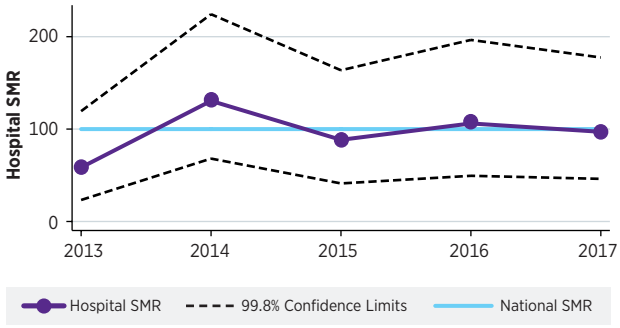
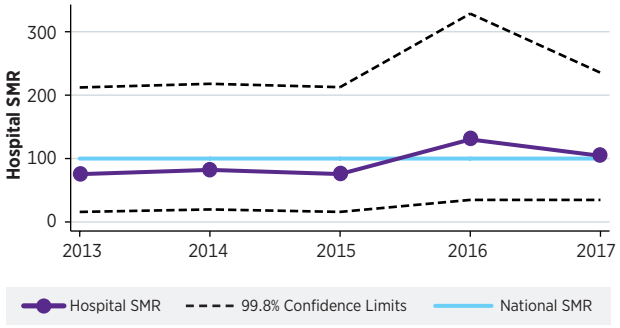


FIGURE A5.5 South/South West Hospital Group

Cork University Hospital: AMI



University Hospital Kerry: AMI



University Hospital Waterford: AMI

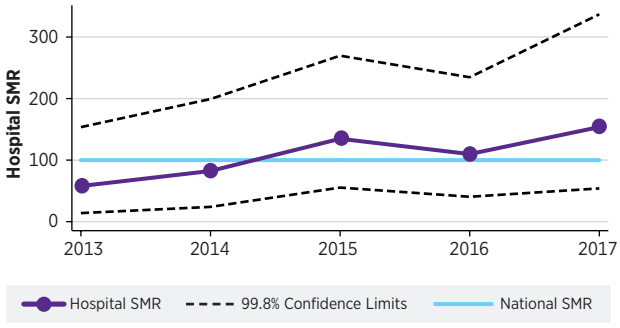
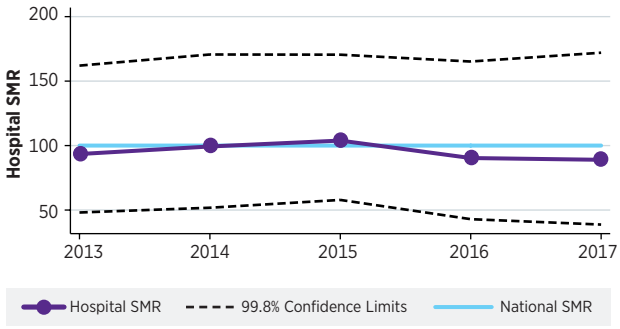


FIGURE A5.6 Saolta University Health Care Group

Galway University Hospitals: AMI



Letterkenny University Hospital: AMI

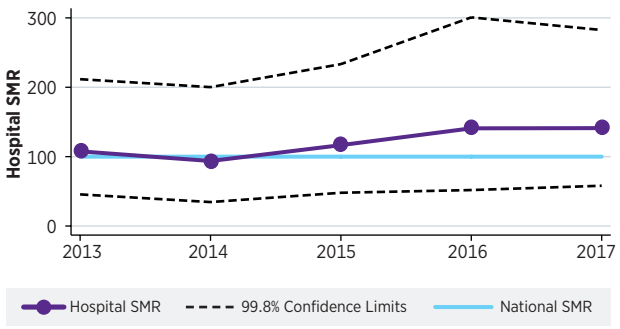
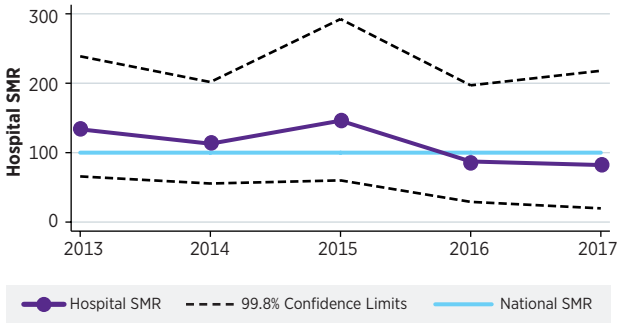
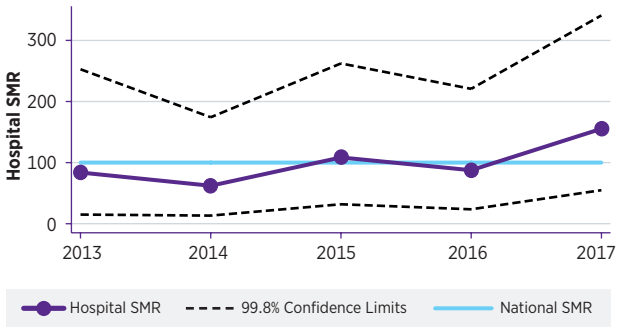


FIGURE A5.6 Saolta University Health Care Group

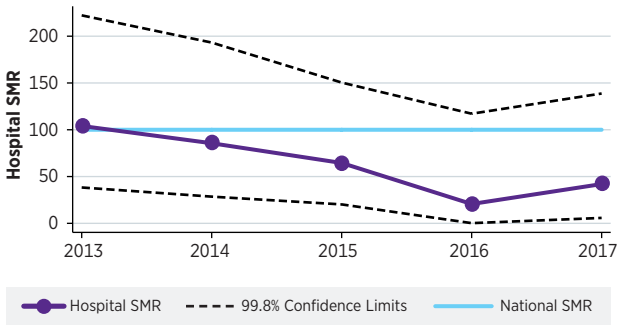
Mayo University Hospital: AMI



Portiuncula University Hospital: AMI



Sligo University Hospital: AMI



APPENDIX 6: HEART FAILURE

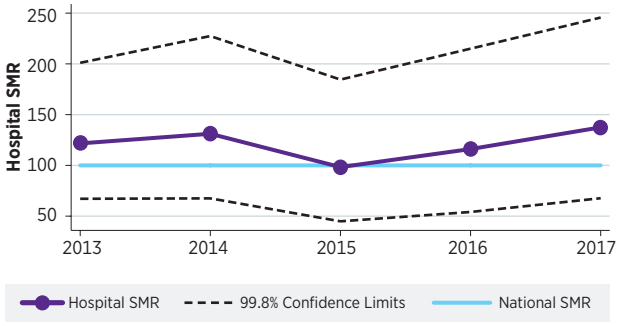
TABLE A6.1: HEART FAILURE INDICATOR

Definition	Standardised mortality ratio with a principal diagnosis of heart failure
Years covered	2017
ICD-10-AM codes	I50, I500, I501, I509
Methodology	**Numerator** Number of actual deaths following admission to hospital with the following ICD-10-AM principal diagnoses: 'Heart failure', 'Congestive heart failure', 'Left ventricular failure', 'Heart failure unspecified' **Denominator** Number of expected deaths for heart failure. This is calculated using an indirect standardisation and logistic regression modelling of all patients admitted to hospital with a principal diagnosis of heart failure

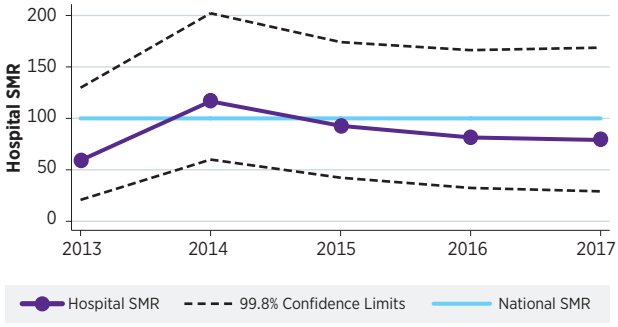
HEART FAILURE SMR CONTROL CHARTS 2013-2017

FIGURE A6.1 RCSI Hospitals

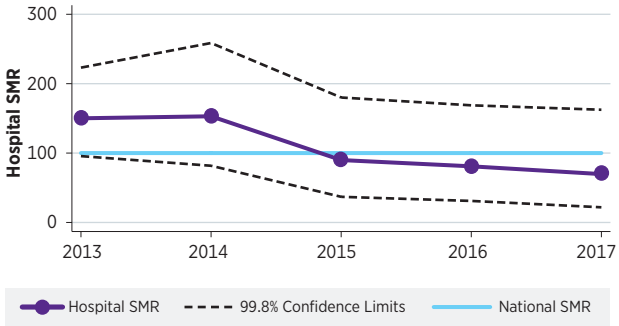
Beaumont Hospital: Heart failure



Cavan General Hospital: Heart failure



Connolly Hospital: Heart failure



Our Lady of Lourdes Hospital, Drogheda: Heart failure

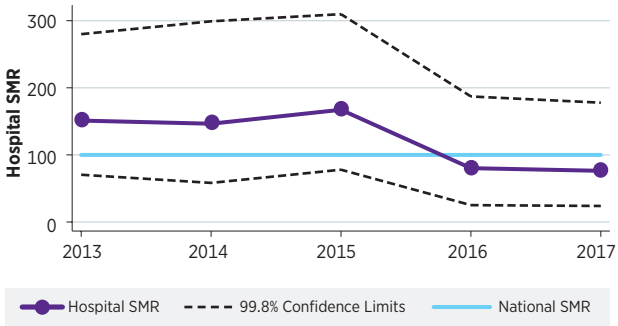
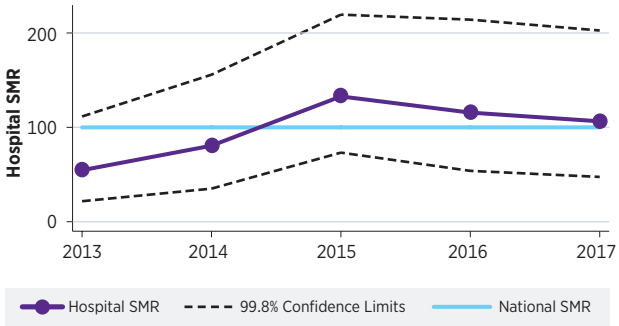
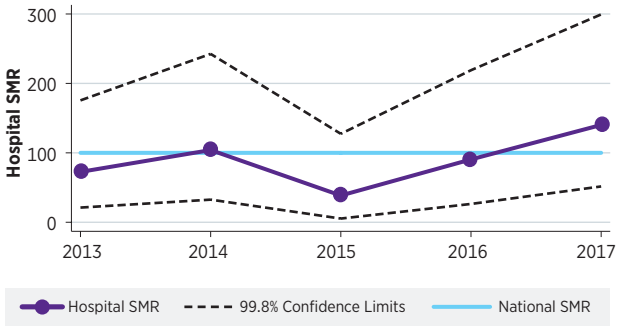


FIGURE A6.2 Ireland East Hospital Group

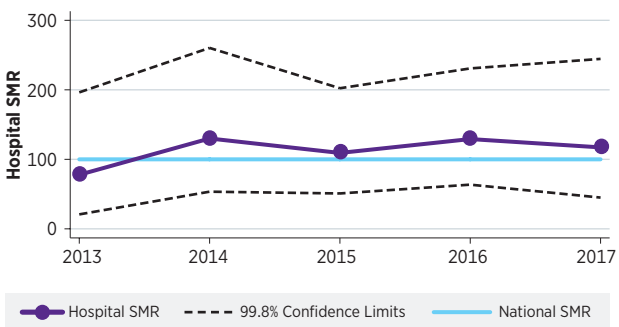
Mater Misericordiae University Hospital: Heart failure



Our Ladys Hospital, Navan: Heart failure



St Luke's Hospital, Kilkenny: Heart failure



St Vincent's University Hospital: Heart failure

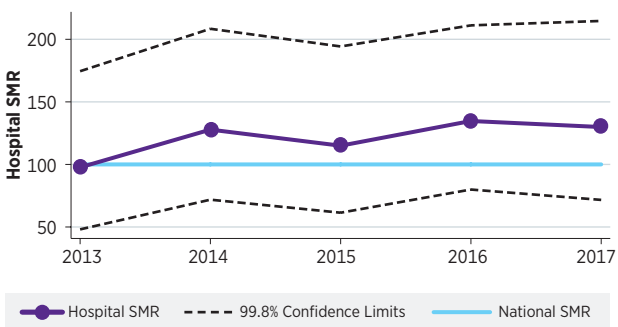
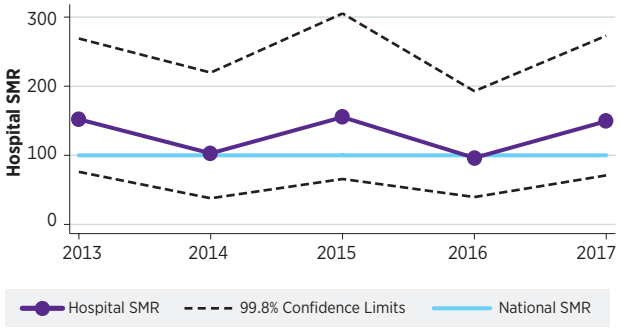


FIGURE A6.2 Ireland East Hospital Group

Wexford General Hospital: Heart failure



Regional Hospital Mullingar: Heart failure

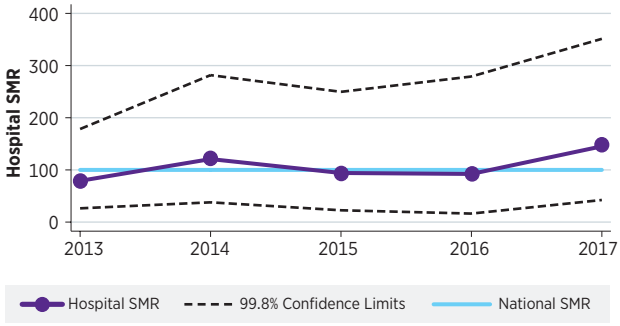
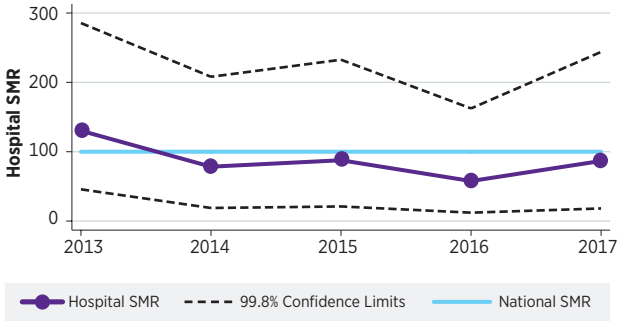
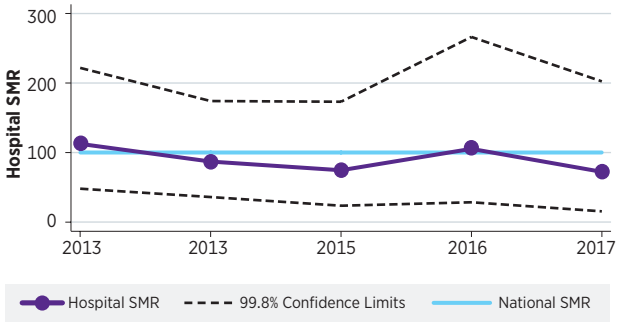


FIGURE A6.3 Dublin Midlands Hospital Group

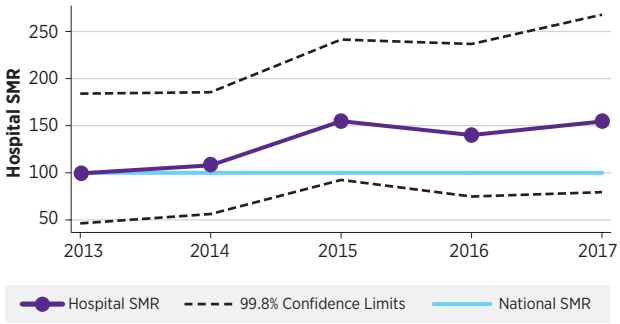
Midland Regional Hospital, Tullamore: Heart failure



Naas General Hospital: Heart failure



St James's Hospital: Heart failure



Tallaght University Hospital (Adult): Heart failure

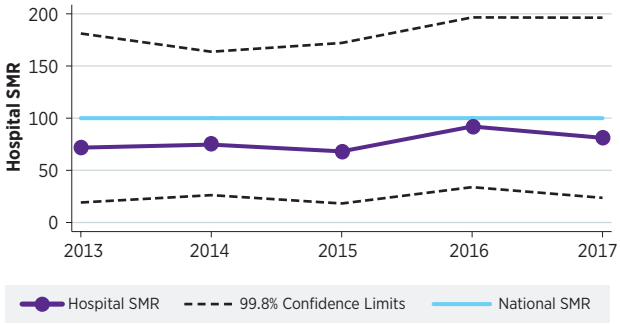
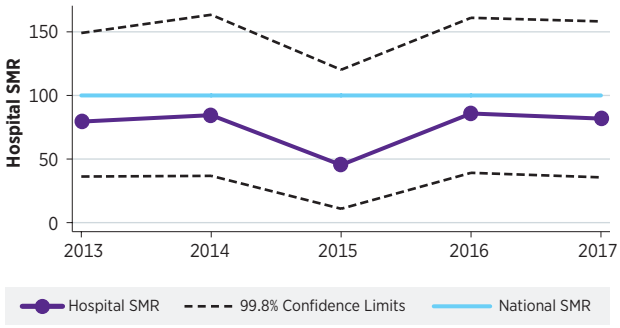
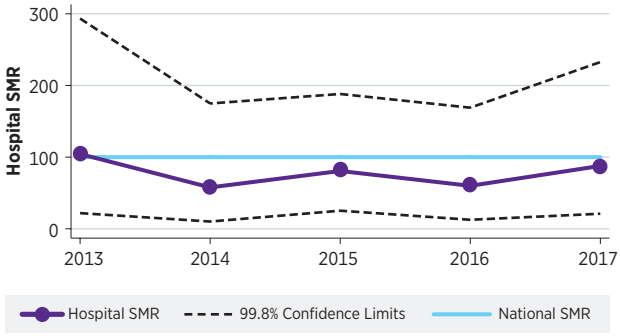


FIGURE A6.4 UL Hospital Group

University Hospital Limerick: Heart failure



Ennis Hospital: Heart failure



Nenagh Hospital: Heart failure

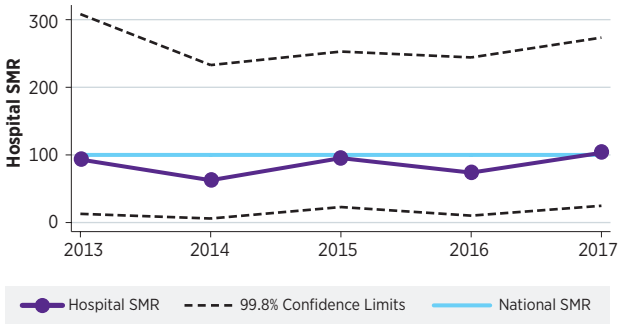
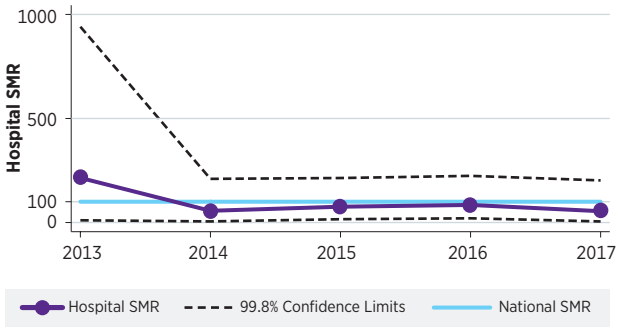
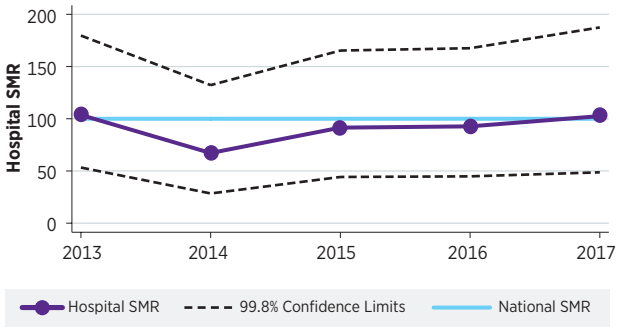


FIGURE A6.5 South/South West Hospital Group

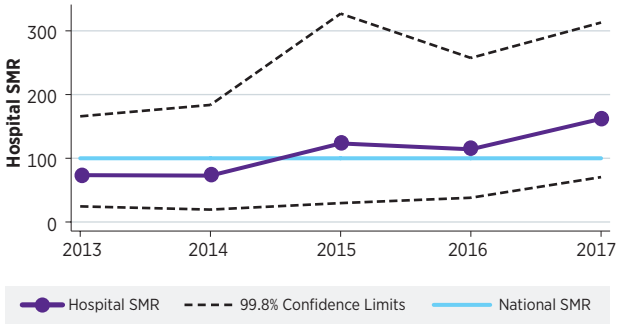
Bantry General Hospital: Heart failure



Cork University Hospital: Heart failure



University Hospital Kerry: Heart failure



Mallow General Hospital: Heart failure

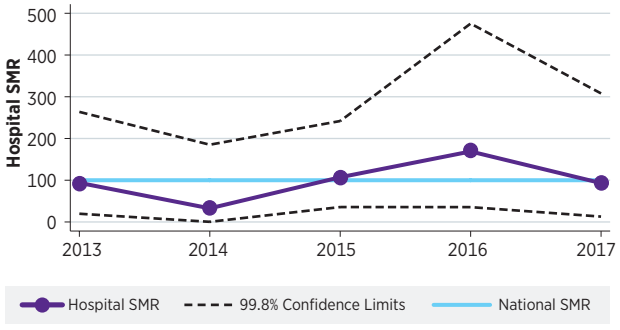
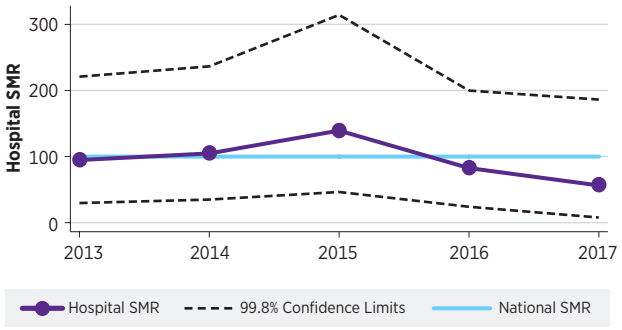
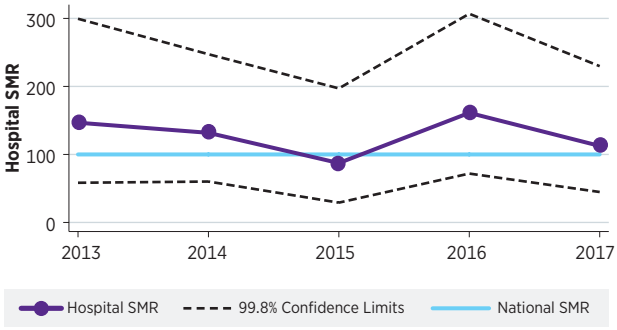


FIGURE A6.5 South/South West Hospital Group

Mercy University Hospital: Heart failure



South Tipperary General Hospital: Heart failure



University Hospital Waterford: Heart failure

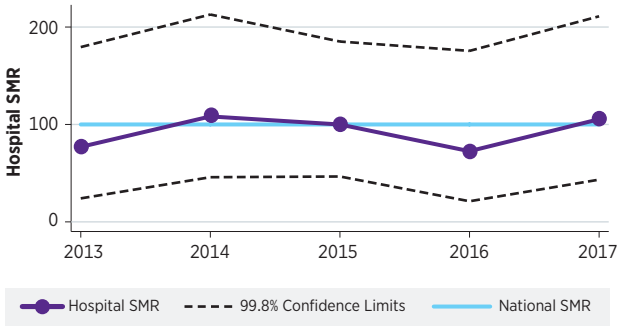
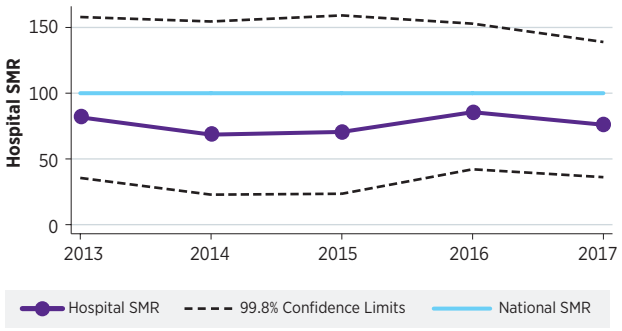
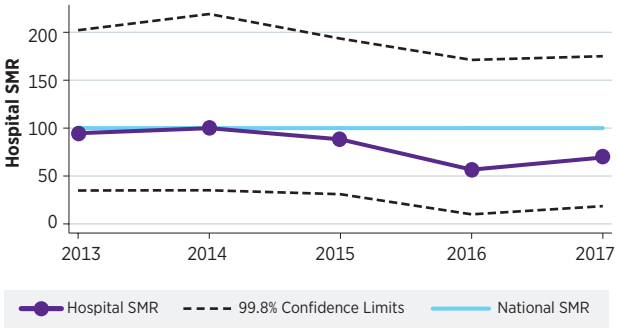


FIGURE A6.6 Saolta University Health Care Group

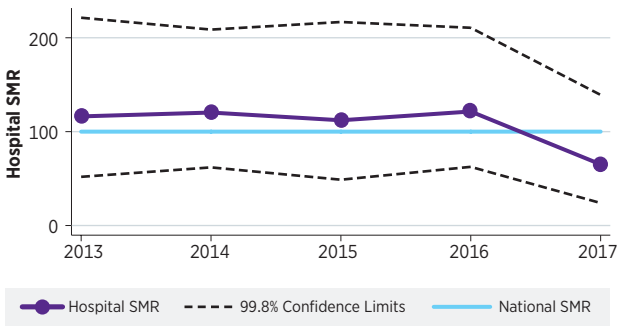
Galway University Hospitals: Heart failure



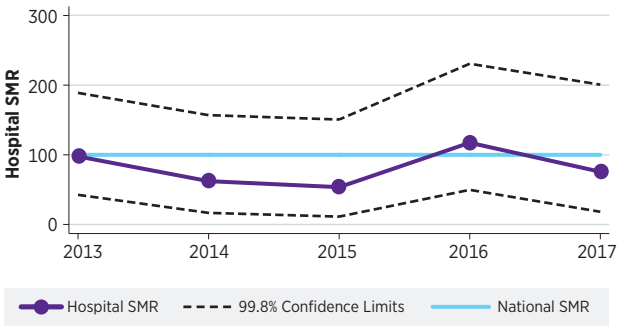
Letterkenny University Hospital: Heart failure



Mayo University Hospital: Heart failure



Sligo University Hospital: Heart failure



APPENDIX 7: ISCHAEMIC STROKE

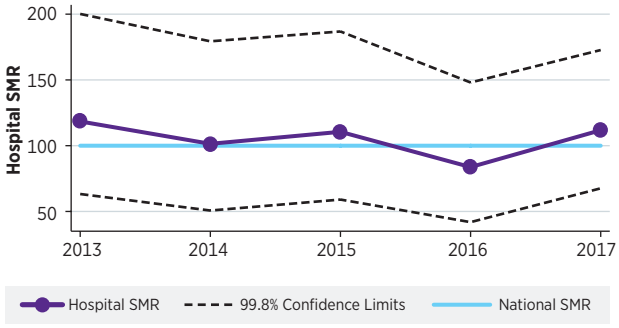
TABLE A7.1: ISCHAEMIC STROKE INDICATOR

Definition	**Standardised mortality ratio with a principal diagnosis of ischaemic stroke**
Years covered	2017
ICD-10-AM codes	I63, I630, I631, I632, I633, I634, I635, I636, I638, I639
Methodology	**Numerator** Number of actual deaths following admission to hospital with the following ICD-10-AM principal diagnoses: 'Cerebral infarction', 'Cerebral infarction due to thrombosis of the pre-cerebral artery', 'Cerebral infarction due to embolism of pre-cerebral artery', 'Cerebral infarction due to unspecified occlusion of pre-cerebral artery', 'Cerebral infarction due to thrombosis of the cerebral artery', 'Cerebral infarction due to embolism of the cerebral artery', 'Cerebral infarction due to unspecified occlusion of the cerebral artery', 'Cerebral infarction due to central venous thrombosis non-pyogenic', 'Other cerebral infarction', 'Cerebral infarction unspecified' **Denominator** Number of expected deaths for ischaemic stroke. This is calculated using an indirect standardisation and logistic regression modelling of all patients admitted to hospital with a principal diagnosis of ischaemic stroke.

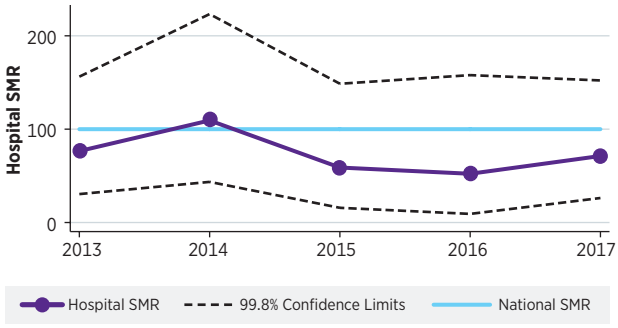
ISCHAEMIC STROKE SMR CONTROL CHARTS 2013-2017

FIGURE A7.1 RCSI Hospitals

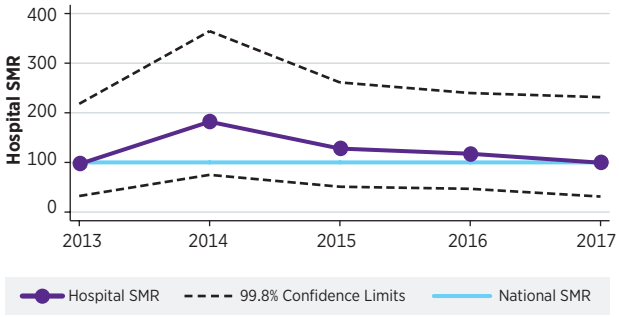
Beaumont Hospital: Ischaemic Stroke



Cavan General Hospital: Ischaemic Stroke



Connolly Hospital: Ischaemic Stroke



Our Lady of Lourdes Hospital, Drogheda: Ischaemic Stroke

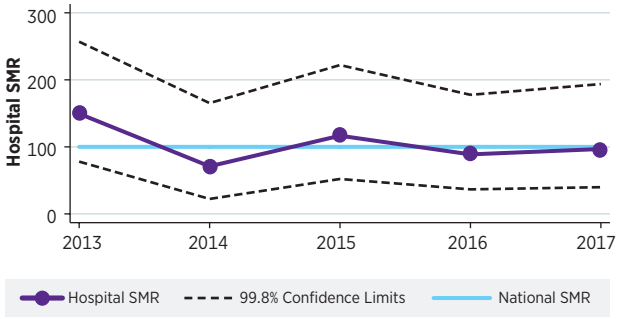
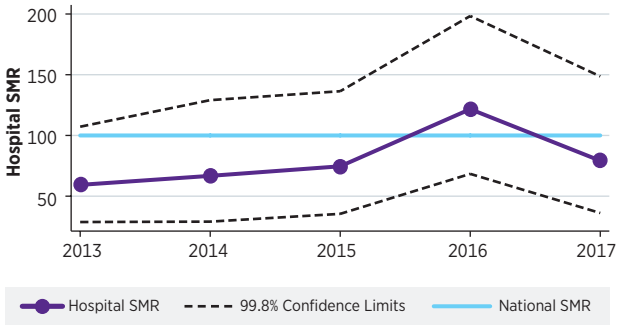
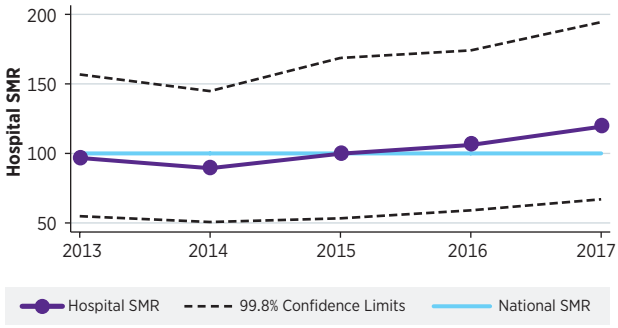


FIGURE A7.2 Ireland East Hospital Group

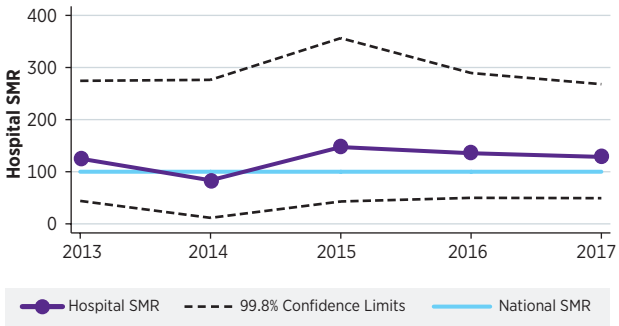
Mater Misericordiae University Hospital: Ischaemic Stroke



St Vincent's University Hospital: Ischaemic Stroke



Wexford General Hospital: Ischaemic Stroke



Regional Hospital Mullingar: Ischaemic Stroke

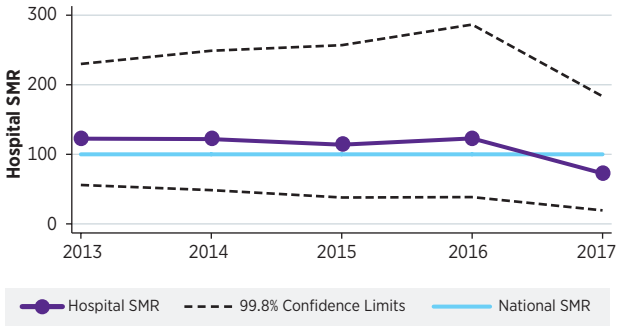
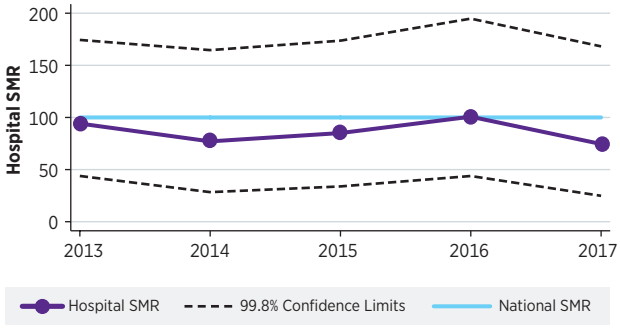
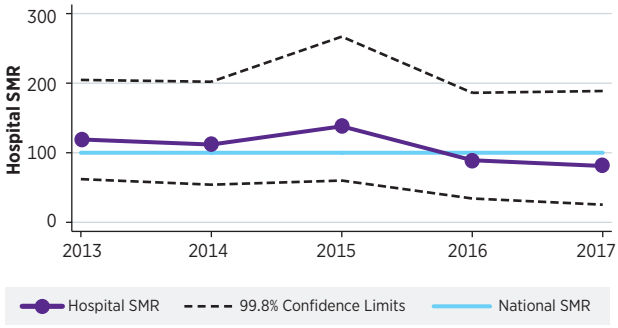


FIGURE A7.3 Dublin Midlands Hospital Group

Naas General Hospital: Ischaemic Stroke



St James's Hospital: Ischaemic Stroke



Tallaght University Hospital (Adult): Ischaemic Stroke

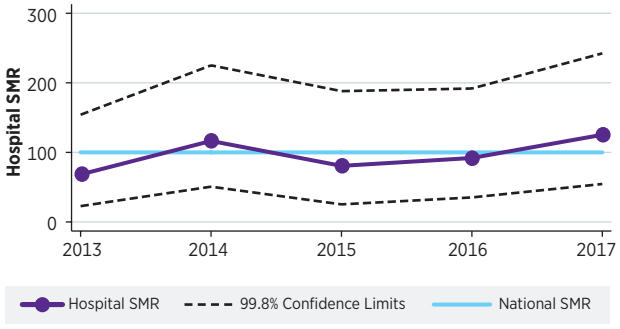


FIGURE A7.4 UL Hospital Group

University Hospital Limerick: Ischaemic Stroke

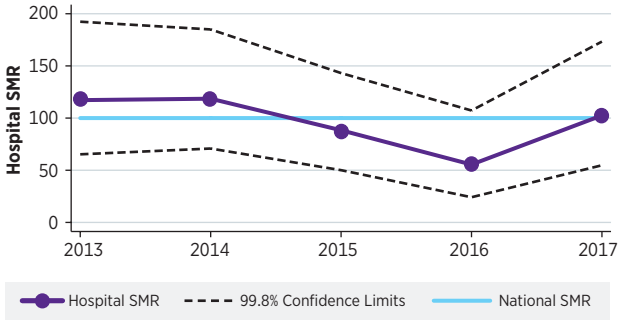
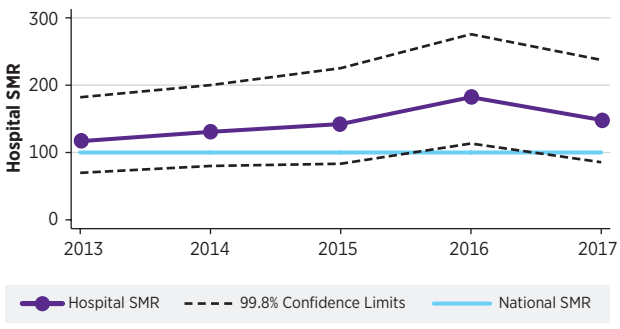


FIGURE A7.5 South/South West Hospital Group

Cork University Hospital: Ischaemic Stroke



University Hospital Kerry: Ischaemic Stroke

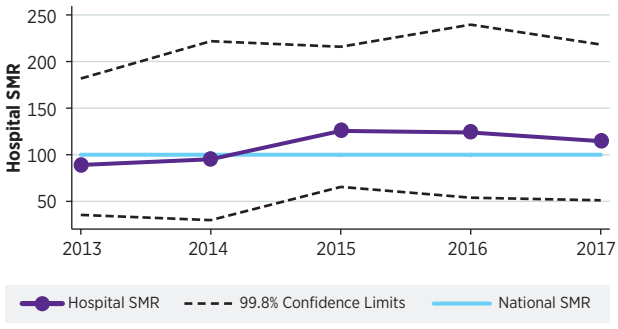


FIGURE A7.5 South/South West Hospital Group

South Tipperary General Hospital: Ischaemic Stroke

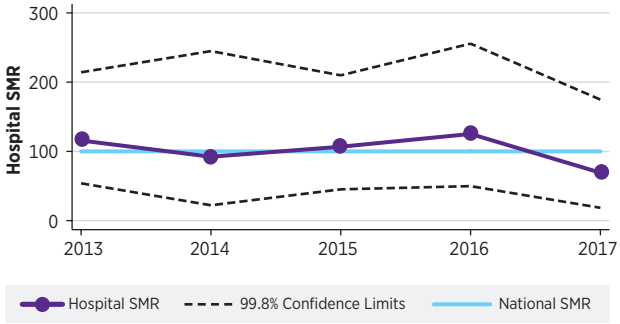
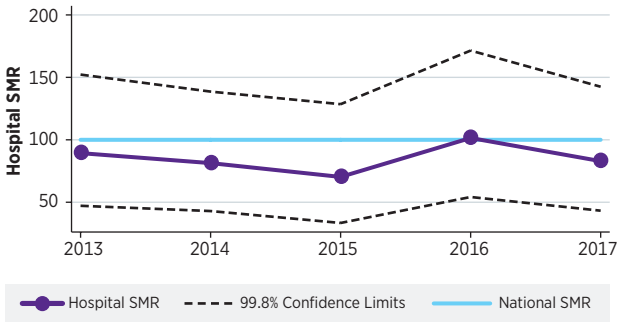
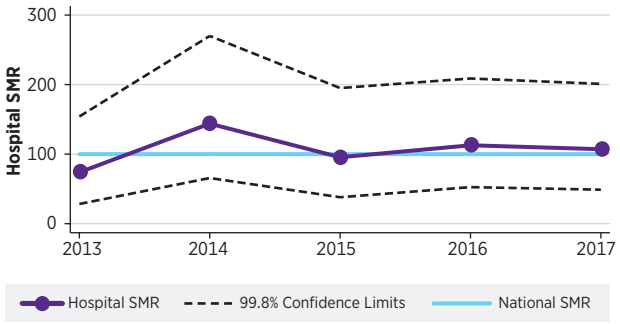


FIGURE A7.6 Saolta University Health Care Group

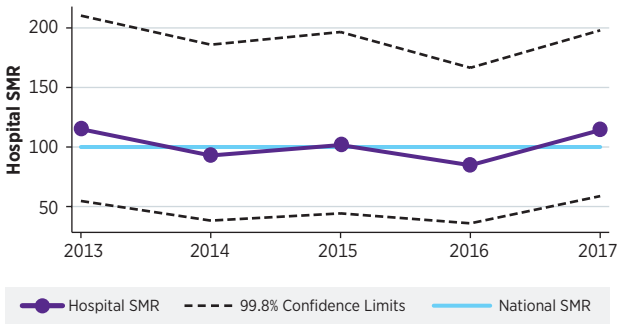
Galway University Hospitals: Ischaemic Stroke



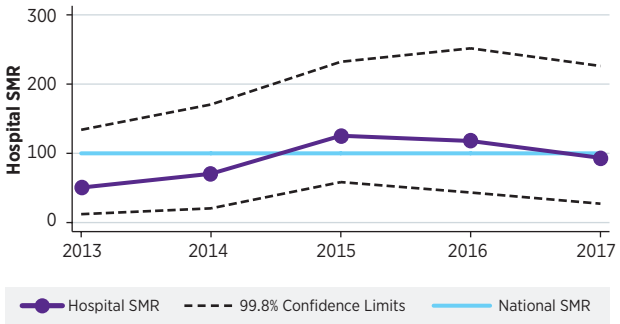
Letterkenny University Hospital: Ischaemic Stroke



Mayo University Hospital: Ischaemic Stroke



Sligo University Hospital: Ischaemic Stroke



APPENDIX 8: HAEMORRHAGIC STROKE

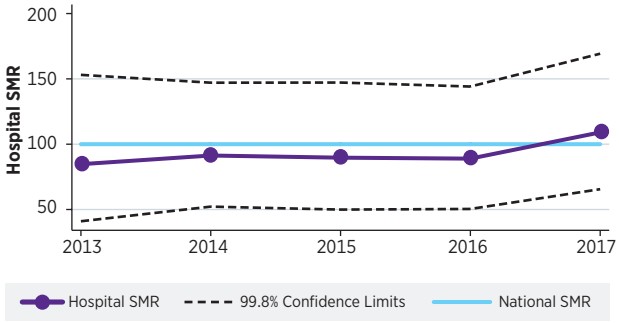
TABLE A8.1: HAEMORRHAGIC STROKE INDICATOR

Definition	Standardised mortality ratio with a principal diagnosis of haemorrhagic stroke
Years covered	2015–2017
ICD-10-AM codes	I60, I600, I601, I602, I603, I604, I605, I606, I607, I608, I609, I61, I610, I611, I612, I613, I614, I615, I616, I618, I619
Methodology	**Numerator** Number of actual deaths following admission to hospital with the following ICD-10-AM principal diagnoses: 'Subarachnoid haemorrhage', 'Subarachnoid haemorrhage, carotid siphon and bifurcation', 'Subarachnoid haemorrhage from middle cerebral artery', 'Subarachnoid haemorrhage from anterior communicating artery', 'Subarachnoid haemorrhage from posterior communicating artery', 'Subarachnoid haemorrhage from basilar artery', 'Subarachnoid haemorrhage from vertebral artery', 'Subarachnoid haemorrhage from other intracranial artery', 'Subarachnoid haemorrhage from intracranial artery unspecified', 'Other subarachnoid haemorrhage', 'Subarachnoid haemorrhage unspecified', 'Intracerebral haemorrhage', 'Intracerebral haemorrhage in hemisphere subcortical', 'Intracerebral haemorrhage in hemisphere cortical', 'Intracerebral haemorrhage in hemisphere unspecified', 'Intracerebral haemorrhage in brain stem', 'Intracerebral haemorrhage in cerebellum', 'Intracerebral haem intraventricular', 'Intracerebral haem multiple localised', 'Other intracerebral haemorrhage', 'Intracerebral haemorrhage unspecified'. **Denominator** Number of expected deaths for haemorrhagic stroke. This is calculated using an indirect standardisation and logistic regression modelling of all patients admitted to hospital with a principal diagnosis of haemorrhagic stroke.

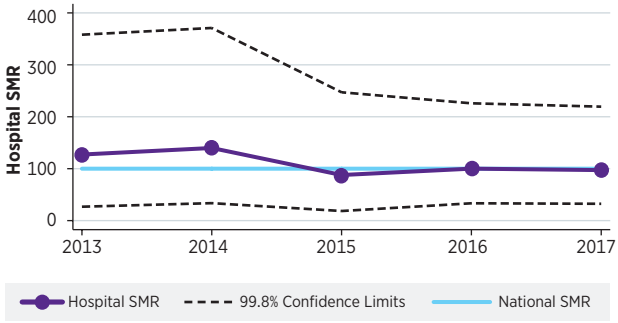
HAEMORRHAGIC STROKE SMR CONTROL CHARTS 2013-2017

FIGURE A8.1 RCSI Hospitals

Beaumont Hospital: Haemorrhagic Stroke



Connolly Hospital: Haemorrhagic Stroke



Our Lady of Lourdes Hospital, Drogheda: Haemorrhagic Stroke

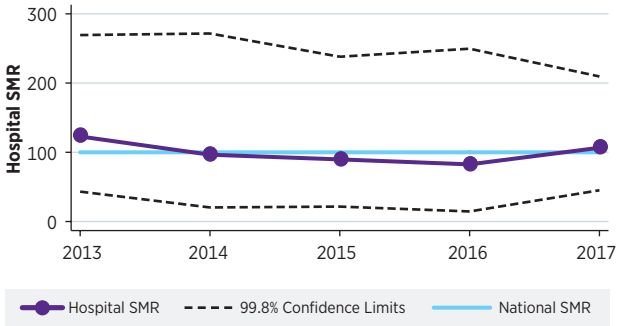
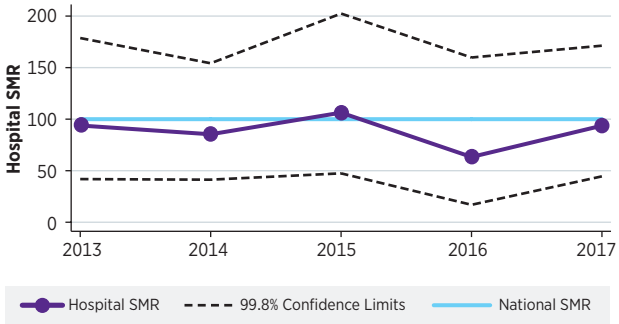


FIGURE A8.2 Ireland East Hospital Group

Mater Misericordiae University Hospital: Haemorrhagic Stroke



St Vincent's University Hospital: Haemorrhagic Stroke

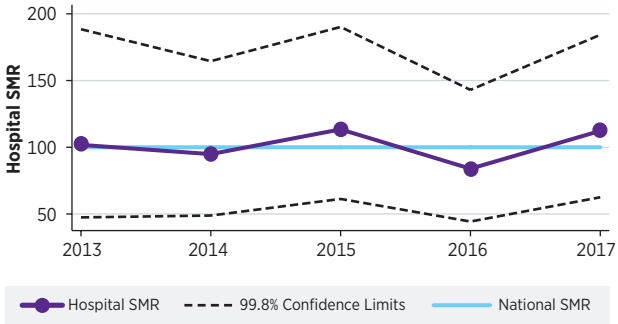


FIGURE A8.3 UL Hospital Group

University Hospital Limerick: Haemorrhagic Stroke

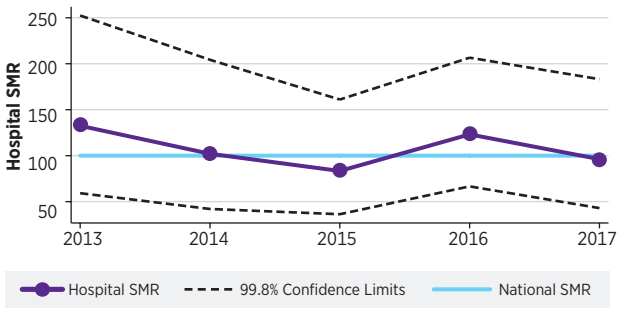
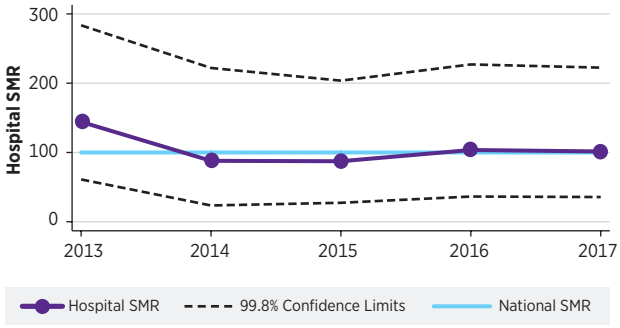
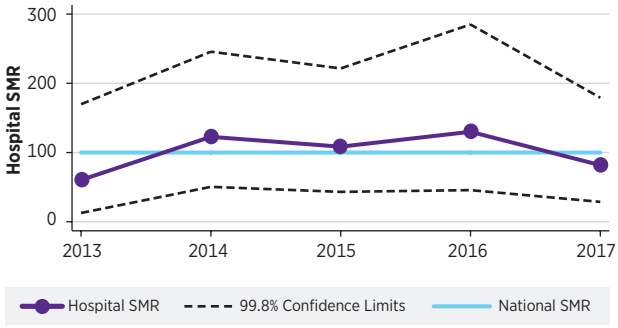


FIGURE A8.4 Dublin Midlands Hospital Group

Naas General Hospital: Haemorrhagic Stroke



St James's Hospital: Haemorrhagic Stroke



Tallaght University Hospital (Adult): Haemorrhagic Stroke

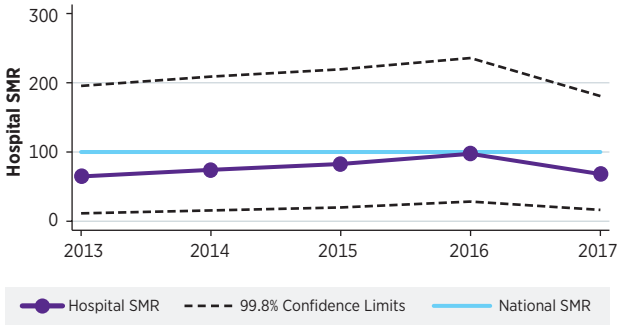
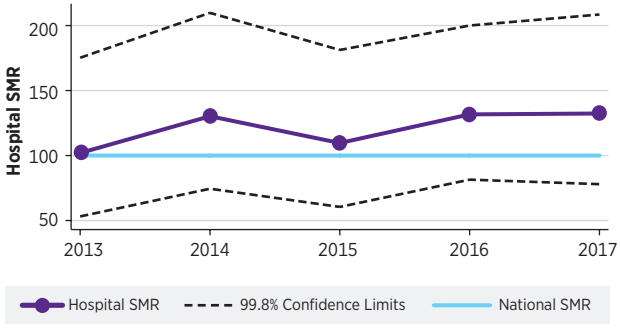


FIGURE A8.5 South/South West Hospital Group

Cork University Hospital: Haemorrhagic Stroke



University Hospital Kerry: Haemorrhagic Stroke

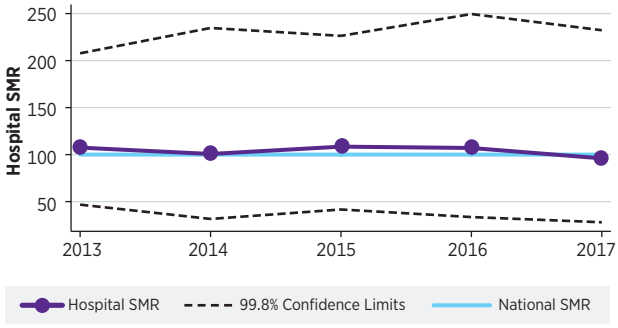
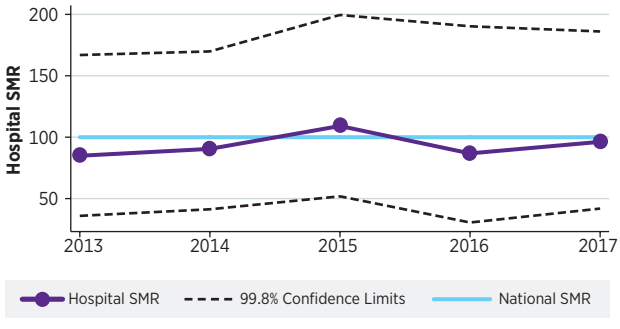


FIGURE A8.6 Saolta University Health Care Group

Galway University Hospitals: Haemorrhagic Stroke



APPENDIX 9: COPD

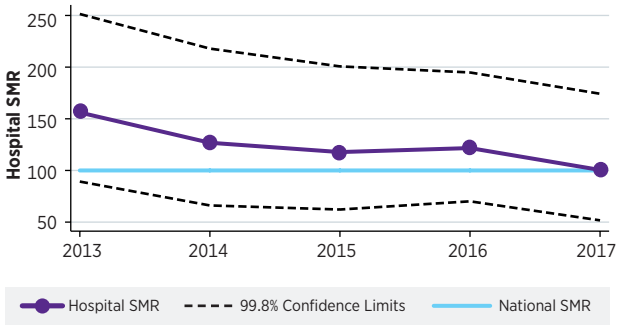
TABLE A9.1: COPD INDICATOR

Definition	**Standardised mortality ratio with a principal diagnosis of COPD**
Years covered	2017
ICD-10-AM codes	J40, J41, J410, J411, J418, J42, J43, J430, J431, J432, J438, J439, J44, J440, J441, J448, J449, J47
Methodology	**Numerator** Number of actual deaths following admission to hospital with the following ICD-10-AM principal diagnoses: 'Bronchitis not specified as acute or chronic', 'Simple and mucopurulent chronic bronchitis', 'Simple chronic bronchitis', 'Mucopurulent chronic bronchitis', 'Mixed simple and mucopurulent chronic bronchitis', 'Unspecified chronic bronchitis', 'Emphysema', 'MacLeod's syndrome', 'Pan-lobular emphysema', 'Centrilobular emphysema', 'Other emphysema', 'Emphysema unspecified', 'Other COPD', 'COPD with acute lower respiratory infection', 'COPD with acute exacerbation unspecified', 'Other specified COPD', 'COPD unspecified', 'Bronchiectasis **Denominator** Number of expected deaths for COPD. This is calculated using an indirect standardisation and logistic regression modelling of all patients admitted to hospital with a principal diagnosis of COPD.

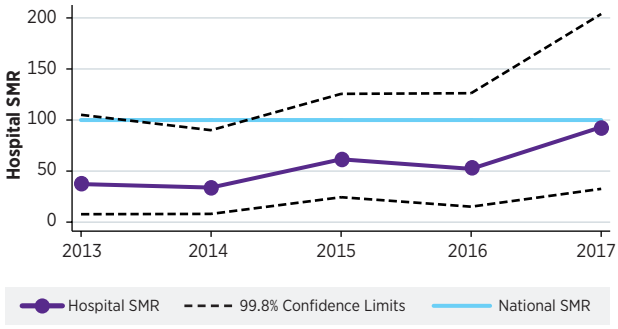
COPD SMR CONTROL CHARTS 2013-2017

FIGURE A9.1 RCSI Hospitals

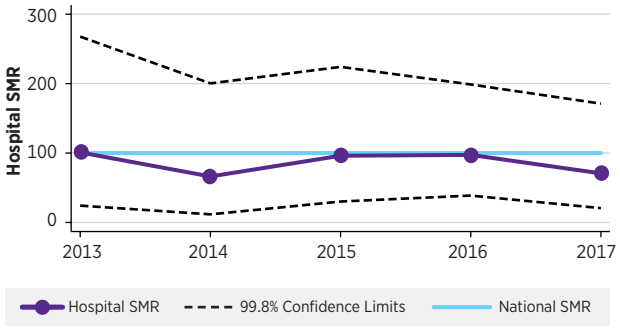
Beaumont Hospital: COPD



Cavan General Hospital: COPD



Connolly Hospital: COPD



Our Lady of Lourdes Hospital, Drogheda: COPD

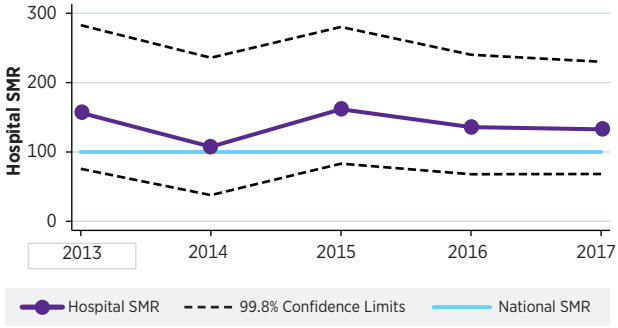
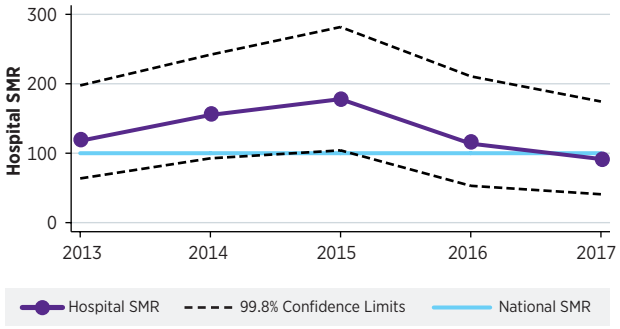
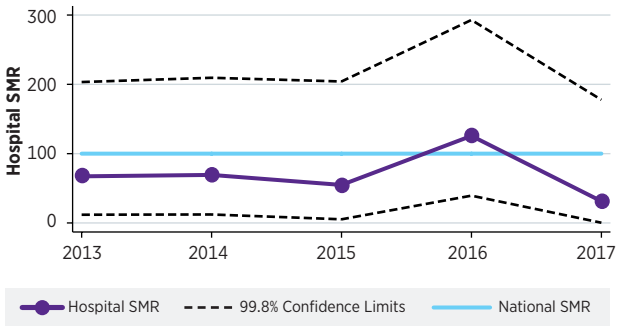


FIGURE A9.2 Ireland East Hospital Group

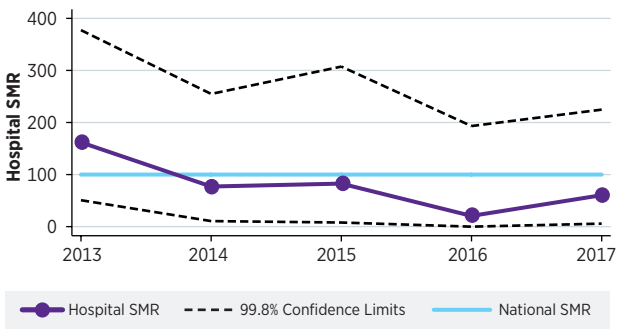
Mater Misericordiae University Hospital: COPD



Our Ladys Hospital, Navan: COPD



St Columcille's Hospital: COPD



St Luke's Hospital, Kilkenny: COPD

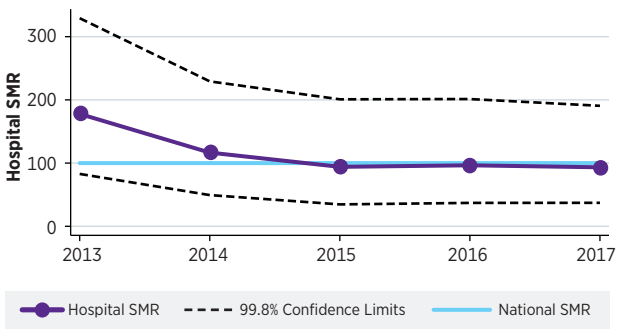
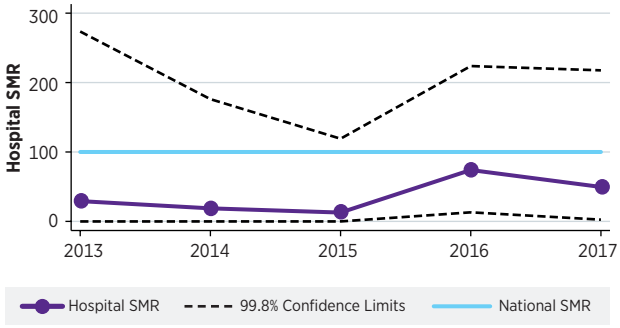
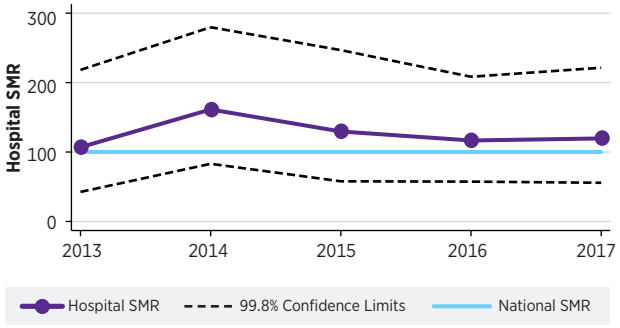


FIGURE A9.2 Ireland East Hospital Group

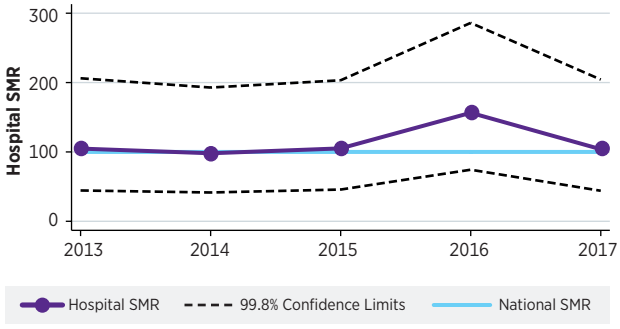
St Michael's Hospital: COPD



St Vincent's University Hospital: COPD



Wexford General Hospital: COPD



Regional Hospital Mullingar: COPD

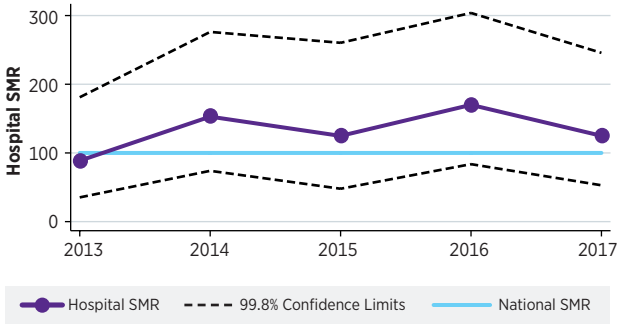
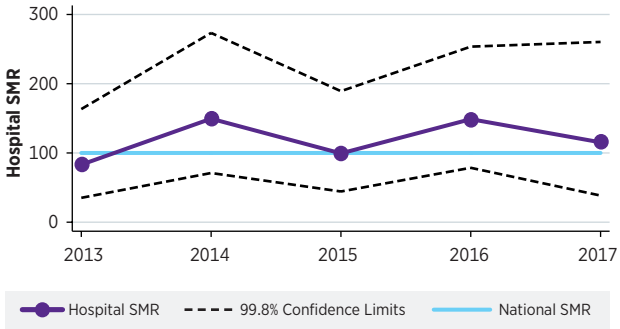
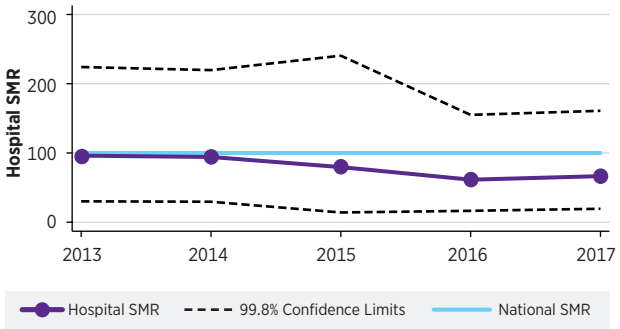


FIGURE A9.3 Dublin Midlands Hospital Group

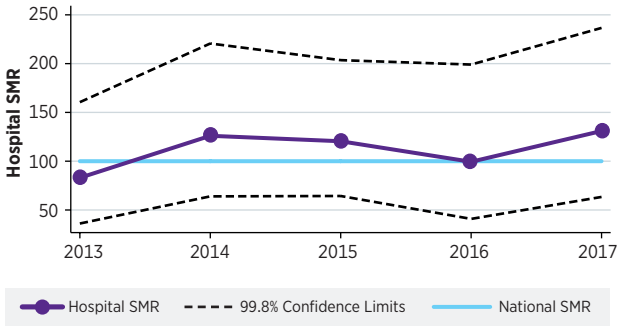
Midland Regional Hospital, Tullamore: COPD



Midland Regional Hospital, Portlaoise: COPD



Naas General Hospital: COPD



St James's Hospital: COPD

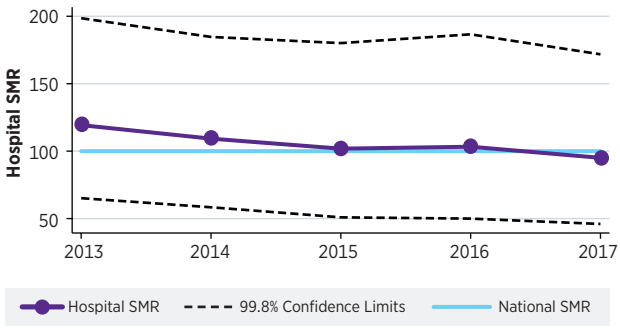


FIGURE A9.3 Dublin Midlands Hospital Group

Tallaght University Hospital (Adult): COPD

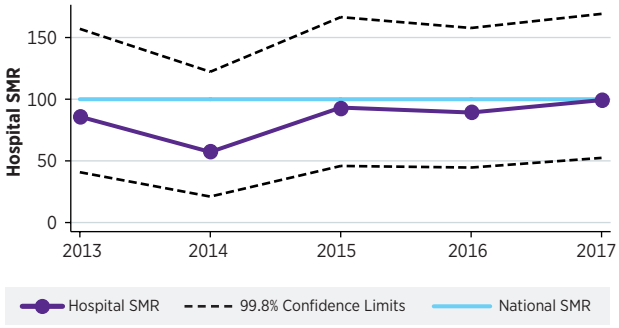
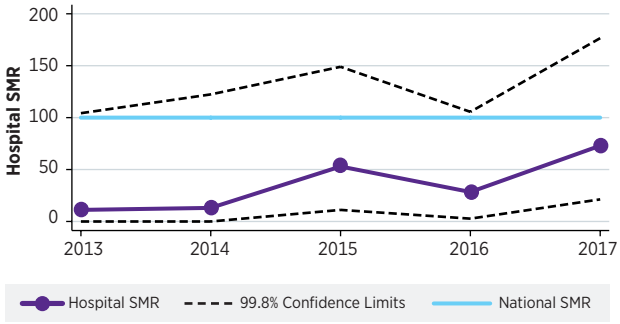
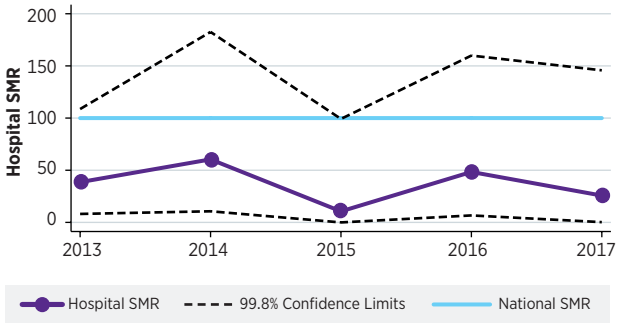


FIGURE A9.4 UL Hospital Group

Ennis Hospital: COPD



St John's Hospital, Limerick: COPD



University Hospital Limerick: COPD

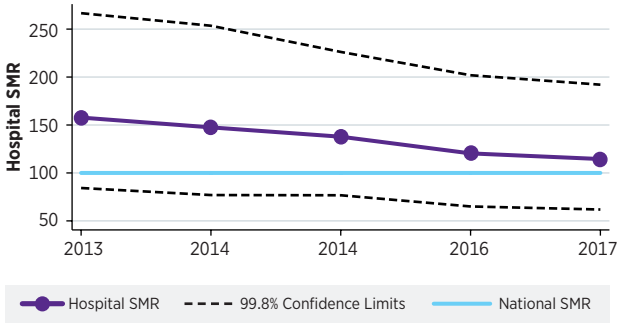
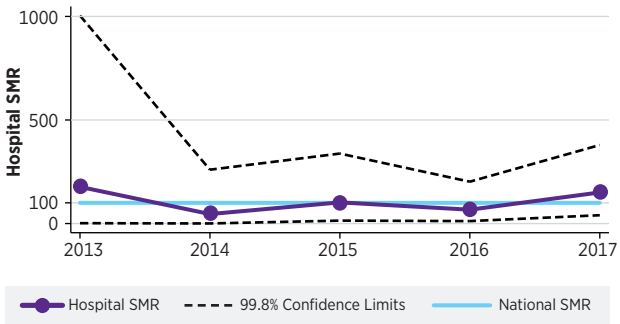


FIGURE A9.5 South/South West Hospital Group

Bantry General Hospital: COPD



Cork University Hospital: COPD

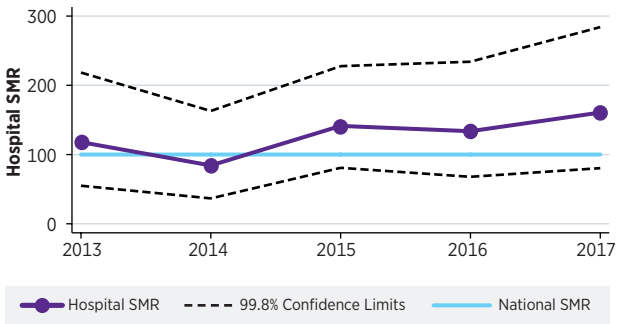
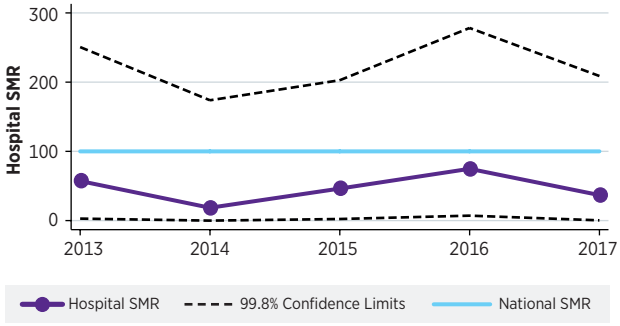
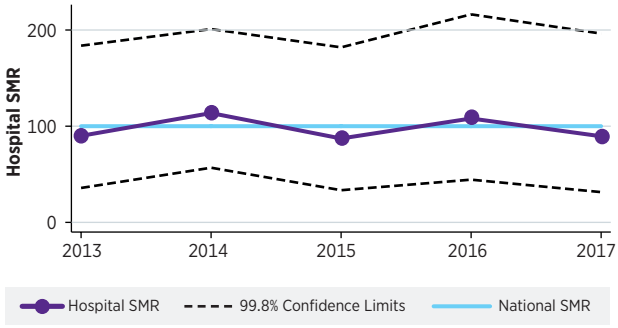


FIGURE A9.5 South/South West Hospital Group

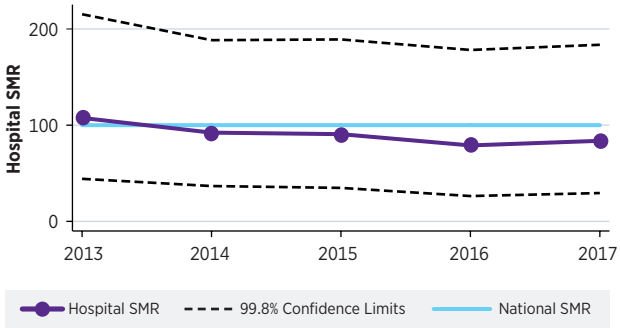
Mallow General Hospital: COPD



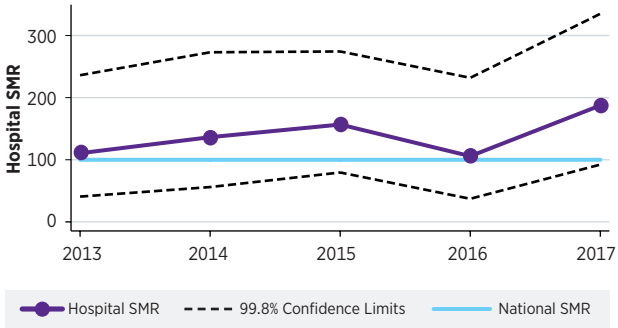
Mercy University Hospital: COPD



South Tipperary General Hospital: COPD



University Hospital Kerry: COPD



University Hospital Waterford: COPD

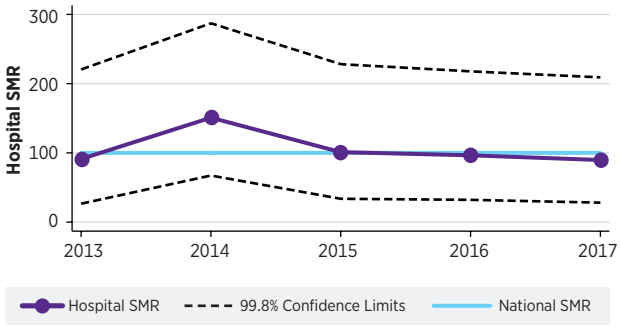
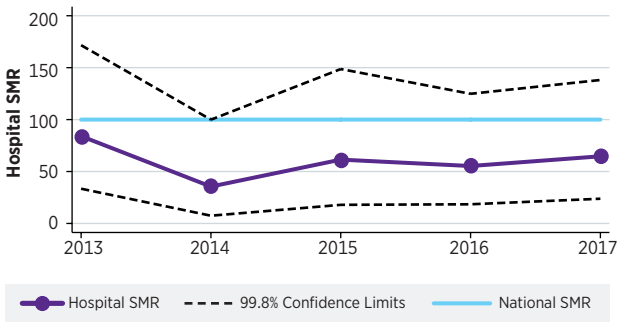


FIGURE A9.6 Saolta University Health Care Group

Galway University Hospitals: COPD



Letterkenny University Hospital: COPD

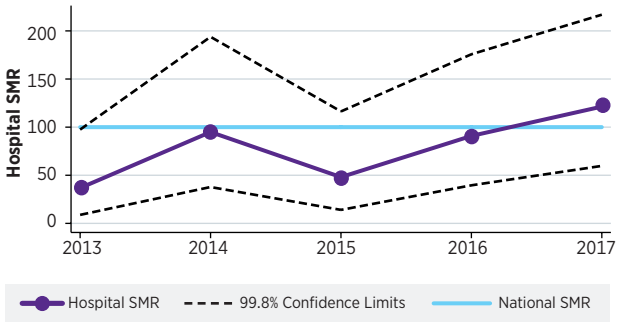
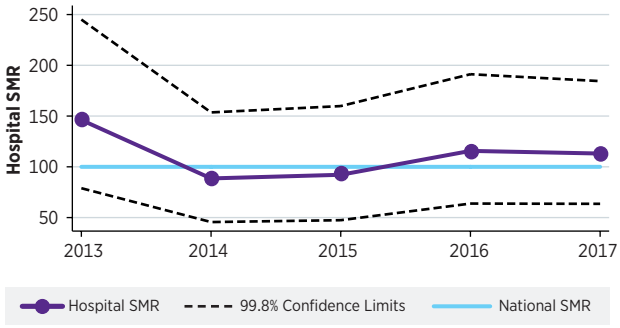
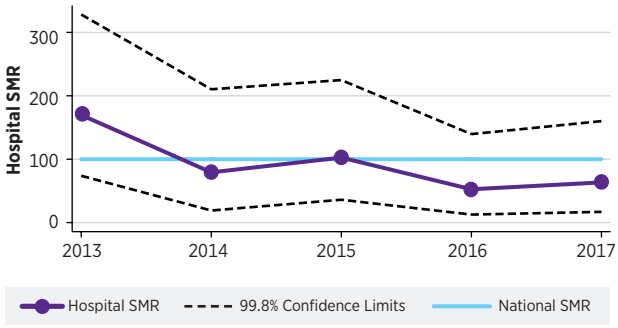


FIGURE A9.6 Saolta University Health Care Group

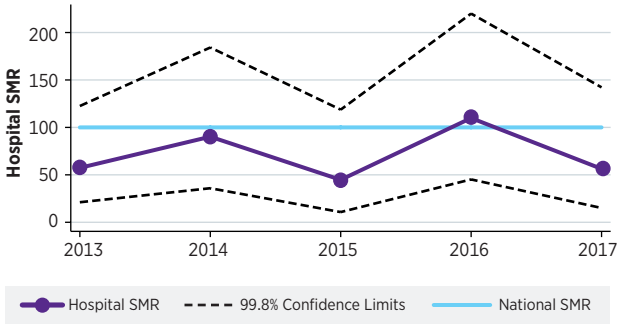
Mayo University Hospital: COPD



Portiuncula University Hospital: COPD



Sligo University Hospital: COPD



APPENDIX 10: PNEUMONIA

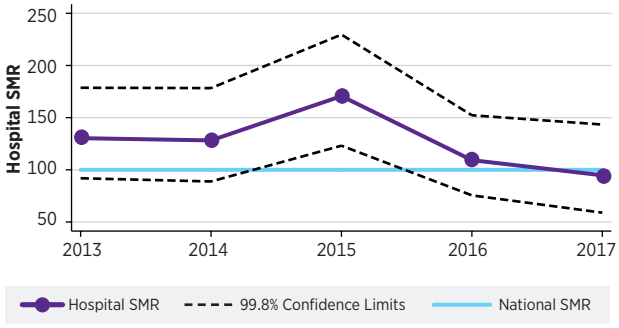
PNEUMONIA INDICATOR

Definition	Standardised mortality ratio with a principal diagnosis of pneumonia
Years covered	2017
ICD-10-AM codes	A202, A212, A221, A310, A420, A430, A481, A78, B012, B052, B250, B583, B59, B671, J12, J120, J121, J122, J123, J128, J129, J13, J14, J15, J150, J151, J152, J153, J154, J155, J156, J157, J158, J159, J16, J160, J168, J17, J170, J171, J172, J173, J178, J18, J180, J181, J182, J188, J189, J85, J850, J851
Methodology	**Numerator** Number of actual deaths following admission to hospital with the following ICD-10-AM principal diagnoses: 'Pneumonic plague', 'Pulmonary tularaemia', 'Pulmonary anthrax', 'Pulmonary mycobacterial infection', 'Pulmonary actinomycosis', 'Pulmonary nocardiosis', 'Legionnaires' disease', 'Q fever', 'Varicella pneumonia', 'Measles complicated by pneumonia', 'Cytomegaloviral pneumonitis', 'Pulmonary toxoplasmosis', 'Pneumocystosis', 'Echinococcus granulosus infection lung', 'Viral pneumonia not elsewhere classified', 'Adenoviral pneumonia', 'Respiratory syncytial virus pneumonia', 'Parainfluenza virus pneumonia', 'Human metapneumovirus pneumonia', 'Other viral pneumonia', 'Viral pneumonia unspecified', 'Pneumonia due to Streptococcus pneumoniae', 'Pneumonia due to Haemophilus influenzae', 'Bacterial pneumonia NEC', 'Pneumonia due to Klebsiella pneumoniae', 'Pneumonia due to Pseudomonas', 'Pneumonia due to staphylococcus', 'Pneumonia due to streptococcus group B', 'Pneumonia due to other streptococci', 'Pneumonia due to Escherichia coli', 'Pneumonia due to other (aerobic) gram negative bacteria', 'Pneumonia due to Mycoplasma pneumoniae', 'Other bacterial pneumonia', 'Bacterial pneumonia unspecified', 'Pneumonia due to other infect organisms NEC', 'Chlamydial pneumonia', 'Pneumonia due to other spec infect organisms', 'Pneumonia in diseases class elsewhere', 'Pneumonia in bacteria disease classified elsewhere', 'Pneumonia in viral disease classified elsewhere', 'Pneumonia in mycoses', 'Pneumonia in parasitic diseases', 'Pneumonia in other disease classified elsewhere', 'Pneumonia organism unspecified', 'Bronchopneumonia unspecified', 'Lobar pneumonia unspecified', 'Hypostatic pneumonia unspecified', 'Other pneumonia organism unspecified', 'Pneumonia unspecified', 'Abscess of lung and mediastinum', 'Gangrene and necrosis of lung', 'Abscess of lung with pneumonia' **Denominator** Number of expected deaths for pneumonia. This is calculated using an indirect standardisation and logistic regression modelling of all patients admitted to hospital with a principal diagnosis of pneumonia.

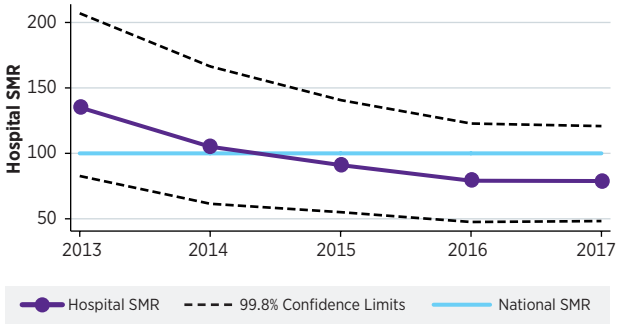
PNEUMONIA SMR CONTROL CHARTS 2013-2017

FIGURE A10.1 RCSI Hospitals

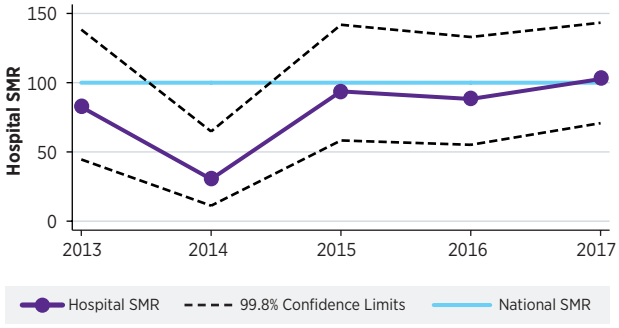
Beaumont Hospital: Pneumonia



Cavan General Hospital: Pneumonia



Connolly Hospital: Pneumonia



Our Lady of Lourdes Hospital, Drogheda: Pneumonia

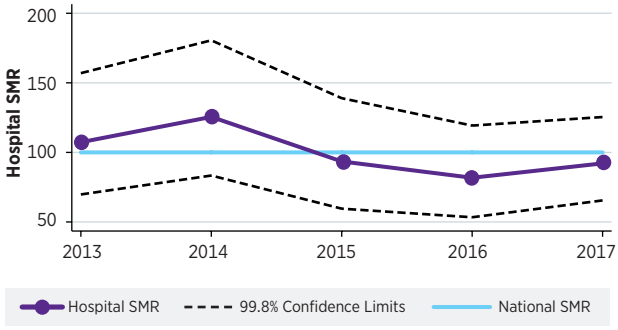
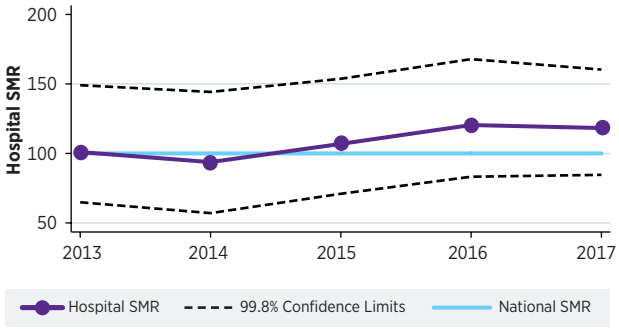
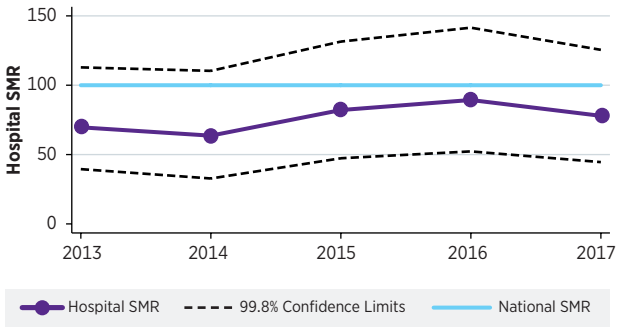


FIGURE A10.2 Ireland East Hospital Group

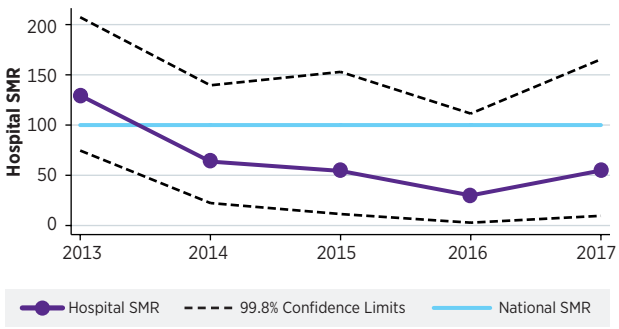
Mater Misericordiae University Hospital: Pneumonia



Our Ladys Hospital, Navan: Pneumonia



St Columcille's Hospital: Pneumonia



St Luke's Hospital, Kilkenny: Pneumonia

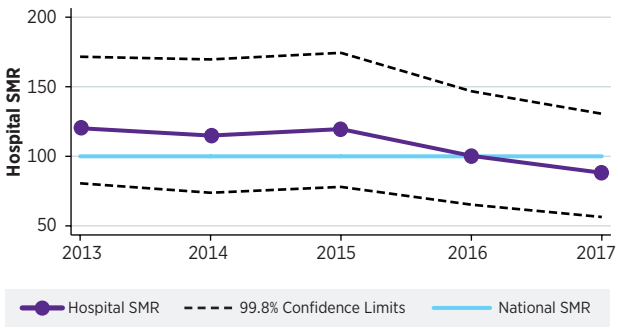
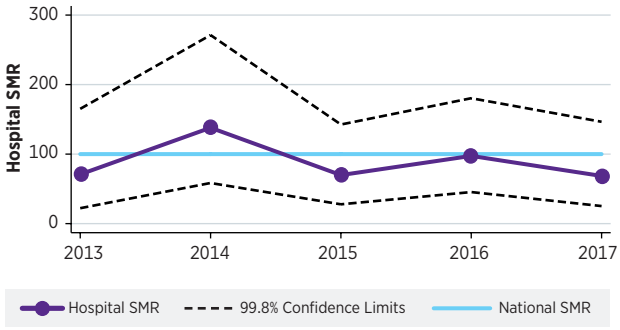
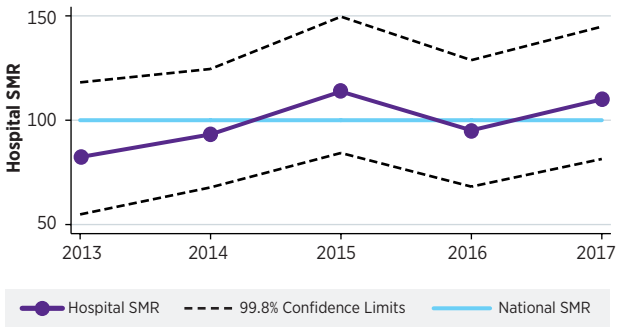


FIGURE A10.2 Ireland East Hospital Group

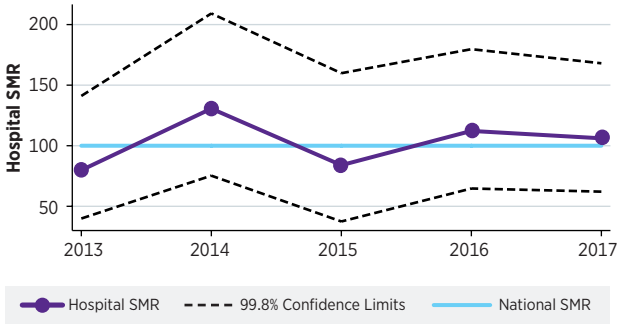
St Michael's Hospital: Pneumonia



St Vincent's University Hospital: Pneumonia



Wexford General Hospital: Pneumonia



Regional Hospital Mullingar: Pneumonia

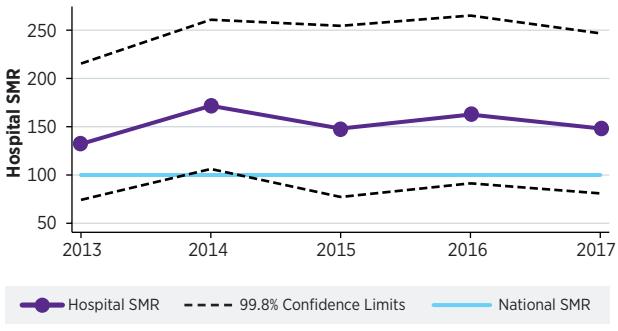
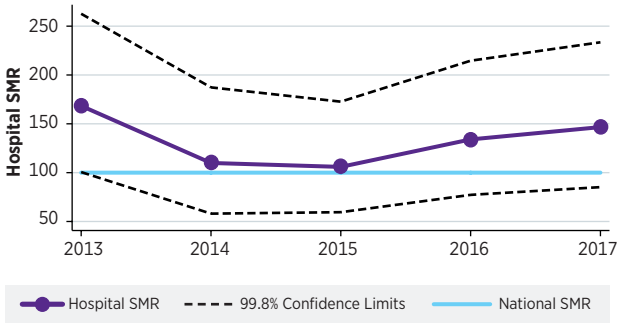
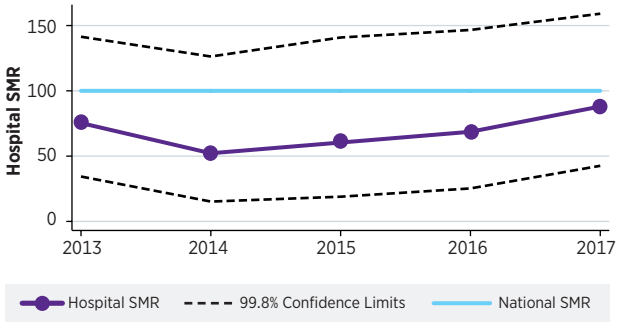


FIGURE A10.3 Dublin Midlands Hospital Group

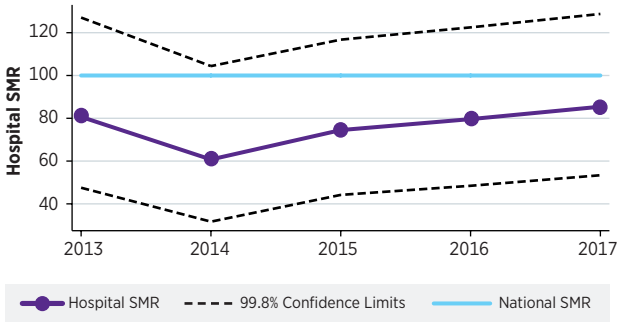
Midland Regional Hospital, Tullamore: Pneumonia



Midland Regional Hospital, Portlaoise: Pneumonia



Naas General Hospital: Pneumonia



St James's Hospital: Pneumonia

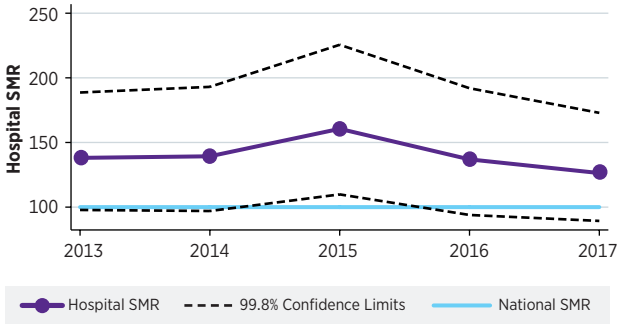


FIGURE A10.3 Dublin Midlands Hospital Group

Tallaght University Hospital (Adult): Pneumonia

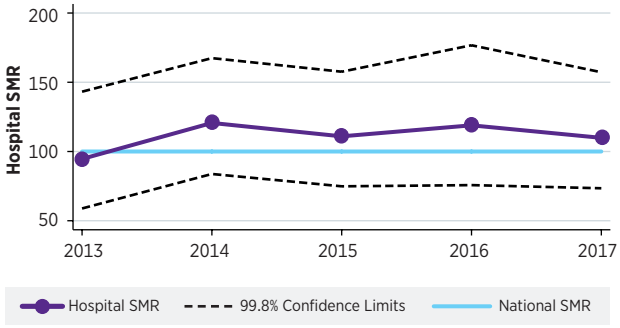
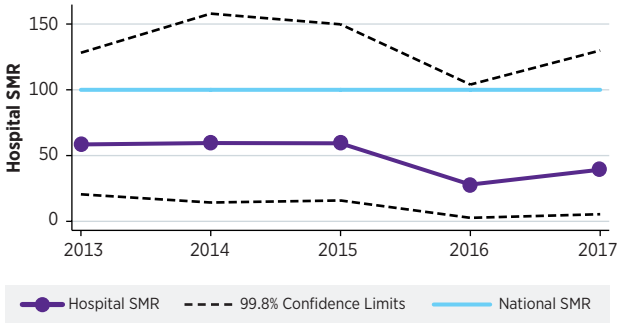


FIGURE A10.4 UL Hospital Group

St John's Hospital, Limerick: Pneumonia



University Hospital Limerick: Pneumonia

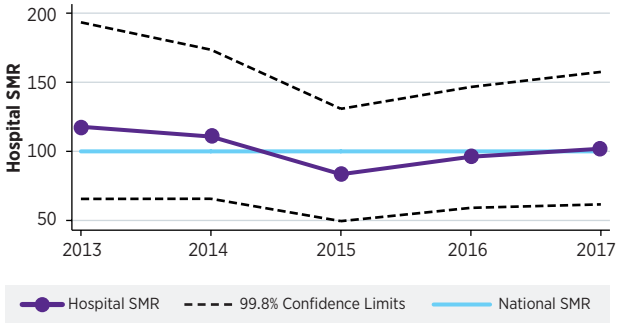
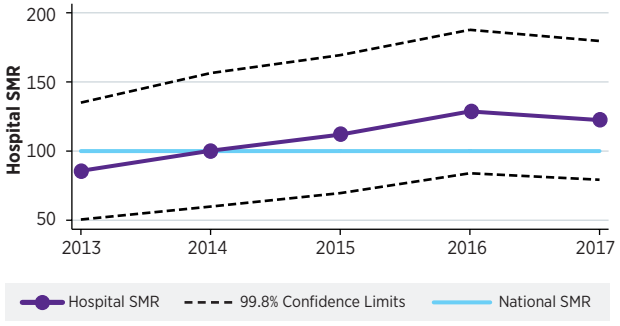
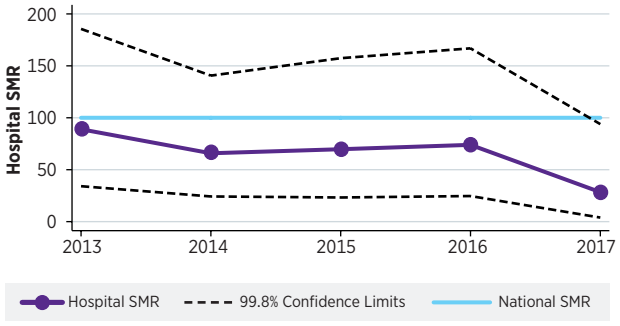


FIGURE A10.5 South/South West Hospital Group

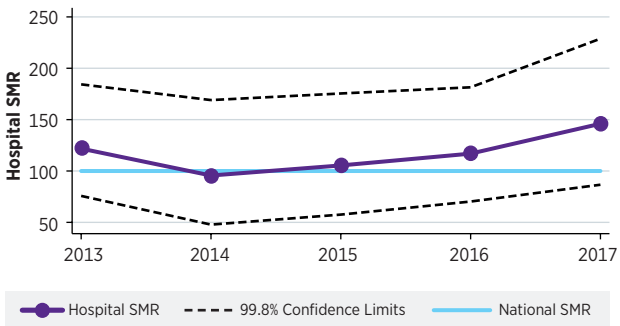
Cork University Hospital: Pneumonia



Mallow General Hospital: Pneumonia



Mercy University Hospital: Pneumonia



South Tipperary General Hospital: Pneumonia

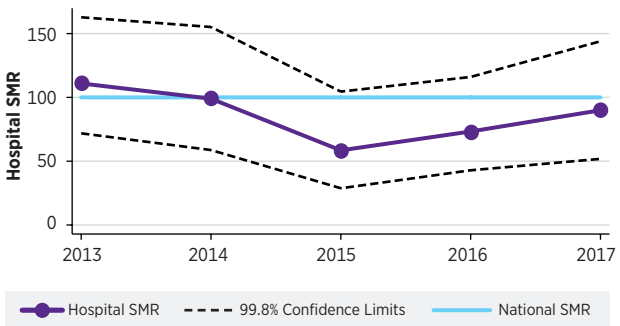
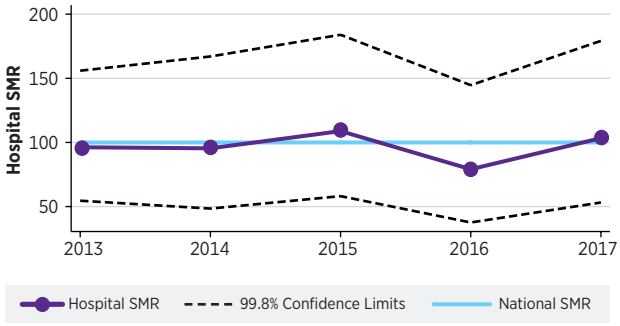


FIGURE A10.5 South/South West Hospital Group

University Hospital Kerry: Pneumonia



University Hospital Waterford: Pneumonia

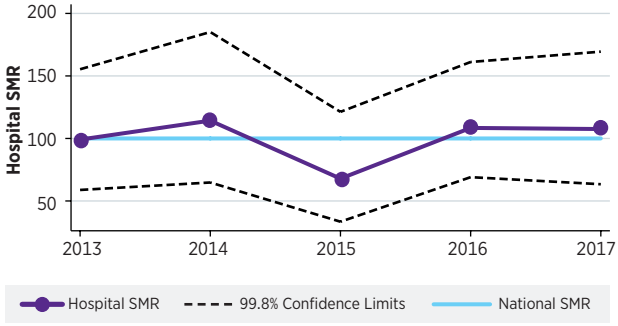
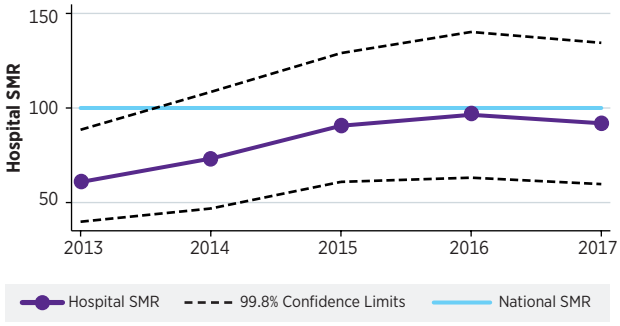
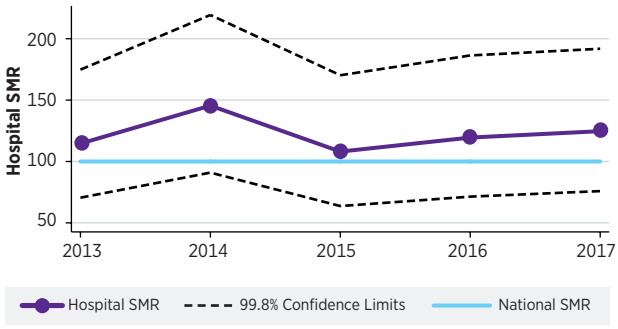


FIGURE A10.6 Saolta University Health Care Group

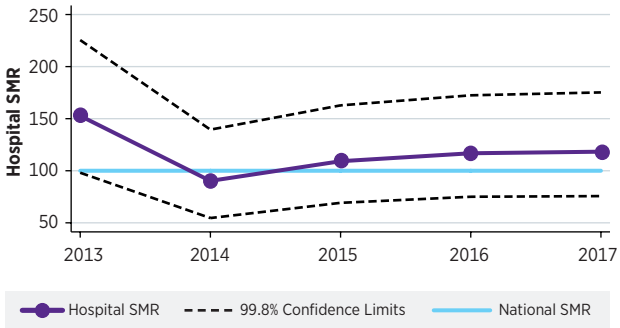
Galway University Hospitals: Pneumonia



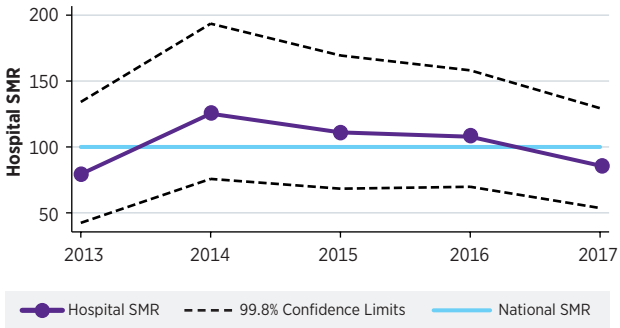
Letterkenny University Hospital: Pneumonia



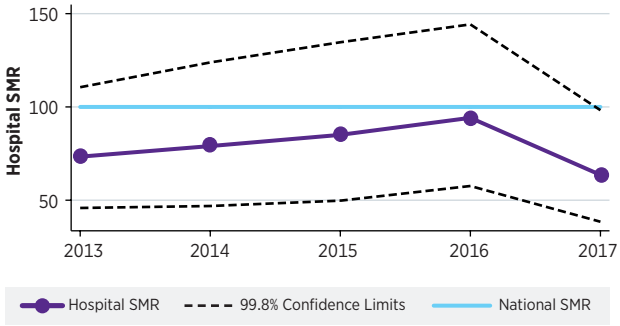
Mayo University Hospital: Pneumonia



Portiuncula University Hospital: Pneumonia



Sligo University Hospital: Pneumonia



APPENDIX 11: GLOSSARY

ACS	Acute coronary syndrome
ADST	Analysis and Display Scientific Team
AHRQ	Agency for Healthcare Research and Quality
AMI	Acute myocardial infarction (heart attack)
CAD	Cronary artery disease
CCI	Charlson Comorbidity Index
CCS	Clinical Classifications Software
COPD	Chronic obstructive pulmonary disease
CuSum	Cumulative summary
HCUP	Healthcare Cost and Utilization Project
HIPE	Hospital In-Patient Enquiry scheme
HIU	Health Intelligence Unit, Strategic Planning and Transformation, HSE
HPO	Healthcare Pricing Office
HSCIC	Health and Social Care Information Centre
HSE	Health Service Executive
ICD-10-AM/ ACHI/ACS	International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification/Australian Classification of Health Interventions/Australian Coding Standards
NAHM	National Audit of Hospital Mortality. A structured review and evaluation of care as part of the clinical audit cycle
MRN	Medical record number
NCCH	National Centre for Classification in Health
NIHSS	National Institutes of Health Stroke Scale
NOCA	National Office of Clinical Audit
NQAIS	National Quality Assurance Improvement System. A suite of audit and performance-monitoring tools developed by the Health Intelligence Unit, Strategic Planning and Transformation, HSE.
NQAIS NAHM	National Quality Assurance Improvement System, National Audit of Hospital Mortality
OECD	Organisation for Economic Co-operation and Development
OoCIO	Office of the Chief Information Officer, HSE
ORS	Optimal reperfusion service
PCI	Percutaneous coronary intervention
PPCI	Primary percutaneous coronary intervention
PRINCIPAL DIAGNOSIS	The diagnosis which was established after investigation and found to be responsible for the episode of admitted patient care, as represented by a code. National Casemix and Classification Centre, Australian Health Services Research Institute, University of Wollongong (2013)
QID	Quality Improvement Division, HSE

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National Office of Clinical Audit

Phone: **+353 1 4028577**
Email: **ihfd@noca.ie**
Twitter: **@noca_irl**
www.noca.ie