National Audit of Hospital Mortality Annual Report 2016

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NCA National Office of Clinical Audit

NAHM National Audit of Hospital Mortality

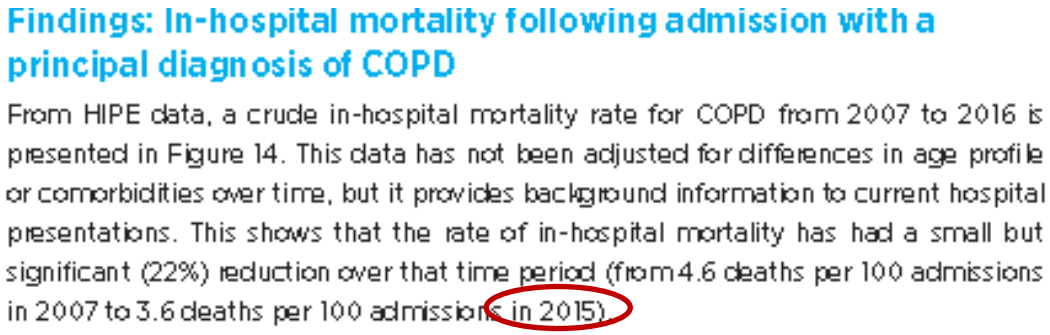
National Audit of Hospital Mortality

Annual Report 2016

Erratum Notice

8th January 2018

An error was discovered in the NAHM Annual Report 2016 after printing was completed.



Findings: In-hospital mortality following admission with a principal diagnosis of COPD

From HIPE data, a crude in-hospital mortality rate for COPD from 2007 to 2016 is presented in Figure 14. This data has not been adjusted for differences in age profile or comorbidities over time, but it provides background information to current hospital presentations. This shows that the rate of in-hospital mortality has had a small but significant (22%) reduction over that time period (from 4.6 deaths per 100 admissions in 2007 to 3.6 deaths per 100 admissions in 2015).

On page 63, the year quoted as highlighted above should read 2016.

The error has been corrected in this version of this report.

Please direct any queries to nahm@noca.ie

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

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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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ACKNOWLEDGMENTS

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

Prof Kieran Daly, Dr Siobhan Jennings, Mr Brendan Cavanagh and colleagues from the National Clinical Programme for Acute Coronary Syndrome

Prof Ken McDonald and Ms Regina Black from the National Clinical Programme for Heart Failure

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

Prof Garry Courtney, Dr Yvonne Smyth and Ms Bláthnaid Connolly from the National Acute Medicine Programme

Health Intelligence, Health and Wellbeing 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 Intelligence System (NQAIS) suite of tools in partnership with OpenApp, the 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 in-patients in Ireland. The HPO provide HIPE data to Health Intelligence, Health and Wellbeing, for the generation of mortality patterns in the NQAIS NAHM tool.

ACKNOWLEDGING SIGNIFICANT CONTRIBUTIONS FROM THE FOLLOWING:

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DESIGNED BY SWERVE

National Office of Clinical Audit

National Audit of Hospital Mortality

ANNUAL REPORT 2016

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

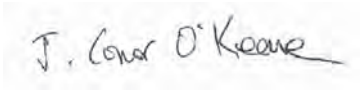
17th November 2017

Dear Dr Creedon,

I wish to acknowledge receipt of the National Audit of Hospital Mortality Annual Report 2016. Following your presentation to the NOCA Governance Board on 16th November 2017 and feedback from our membership, we are delighted to endorse this report.

On behalf of the NOCA Governance Board, I wish to congratulate your own and your colleagues continued efforts in supporting this valuable quality improvement initiative. We strongly welcome the recommendations and quality improvement learnings displayed in this report, which represent a significant advance on last year and represent considerable progress over a relatively short time period in such a challenging and complex area as mortality. We commend, in particular, the increased engagement with hospitals and the evidence of shared learning. Work will continue to ensure hospitals are supported to monitor and review their own use of NAHM data. 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

FOREWORD

DR BRIAN CREEDON

BRIAN O'MAHONY

MARGARET MURPHY

The standardised mortality ratio (SMR) is a complex health care quality measure that will play an important role in the health and wellbeing of Irish patients as it is used to identify potential data, safety and quality of care issues. The SMR is the ratio between the observed number of patients who die and the number that would be expected to die in hospital on the basis of the overall national rate. The quality of the Irish health service cannot be measured by one indicator alone; SMRs are most useful when used as part of a broader measurement strategy including other indicators that impact on patient outcomes.

This report by the National Audit of Hospital Mortality (NAHM) in the National Office of Clinical Audit (NOCA), presents hospital mortality information in a clear and transparent manner, which will be of interest to patients, the public at large and health care professionals. As with all quality improvement efforts, a hospital whose aim is to prevent potentially avoidable deaths must begin with the collection and analysis of accurate data. This report presents an analysis of mortality from the National Audit of Hospital Mortality between 2014 and 2016. There are 44 publicly funded hospitals contributing data to the audit. We welcome the commitment of our hospitals to understanding their data and working to implement change to improve patient safety, demonstrating a culture of learning and improvement in hospitals.

It is important that the information in this report is used responsibly. Differences in mortality between hospitals may not necessarily suggest different standards or quality of care; one hospital may have a higher mortality rate than another as it is a specialist centre and therefore cares for the sickest patients, therefore its data are not reflective of inferior care. Differences may also be due to variations in the way data are collected. However, where a hospital's SMR is unexpectedly high or low it is a clear signal that further examination and exploration of the data is warranted.

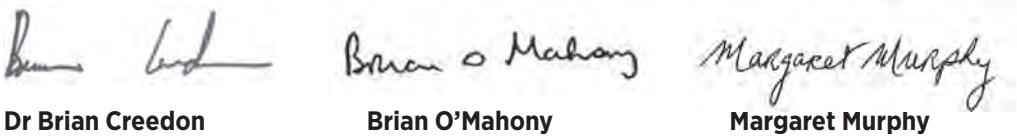
This project is focused on the importance of producing accurate data which will support improvements in the quality of care provided in Irish hospitals. NAHM is supporting the important issue of transparency by sharing this data publicly. This level of transparency will ultimately foster improved trust between patients and their hospitals. NOCA remains committed to continuing to work with hospitals on this journey.

Included in this report are commentaries from hospitals which had signals generated from National Quality Assurance Intelligence System (NQAIS) NAHM. These hospitals are to be commended for sharing their findings. The individual hospitals utilised quality improvement techniques such as data verification and clinical (chart) reviews. Our hospital

system can learn from the quality improvement approaches utilised and the actual quality improvements implemented.

Everyone may be a hospital patient at some stage during their lives and will expect to receive care of the highest quality. We will continue to make this analysis of mortality available to hospitals, provide tools to support the use of this analysis and share learnings from hospitals, hospital groups and boards using this data in different ways. We will also continue to work with hospitals and others to improve the quality of data, refine the methods used in this audit and develop annual reports. This includes working with healthcare and public stakeholders to build a set of quality measures that will be useful for improving care provided in hospitals.

This report would not have been possible without the collaboration of numerous stakeholders. We wish to acknowledge all contributions which were essential in facilitating this report.



Dr Brian Creedon
Chair
NAHM Governance
Committee

Brian O'Mahony
Public Representative
NAHM Governance
Committee

Margaret Murphy
Patient Advocate
World Health
Organisation

PREFACE

NOCA, and members of the NAHM Governance and Steering Committees, would like to acknowledge the great contribution from Mel McIntyre since the inception and initial development of NQAIS NAHM in conjunction with Health Intelligence, Health and Wellbeing, HSE. Mel was instrumental to the vision of how to present complex NAHM data to its end users and facilitating the production of this report for NAHM.

Mel was the founder of OpenApp, the software development company who developed and supports the use of the NQAIS suite of applications. Full of vision and innovation, Mel was a problem solver first and foremost. He believed that in healthcare informatics the patient should be placed at the centre of all solutions, platforms and services.

Sadly, Mel died June 2017, but his commitment to problem solving and delivering applications which work in the real world remain inspirational.

Dr Brian Creedon
Chair
NAHM Governance
Committee

Howard Johnson
Clinical Lead
Health Intelligence,
Health and Wellbeing, HSE

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EXECUTIVE SUMMARY

The purpose of this report is to provide patients, families, the public and the wider health system with an account of the National Audit of Hospital Mortality (NAHM) and its findings across an initial number of key diseases/medical conditions. This report outlines how the audit is used by hospitals and how the National Office of Clinical Audit (NOCA) engages with hospitals. Information is presented across six key diagnoses: acute myocardial infarction (heart attack), heart failure, ischaemic stroke, haemorrhagic stroke, chronic obstructive pulmonary disease (chronic lung disease) and pneumonia. These diagnoses were chosen based on clinical and methodological selection criteria, to ensure a focus on quality, safety and improvement in acute hospital care.

National Quality Assurance Intelligence System (NQAIS) NAHM displays in-hospital mortality patterns and standardised mortality ratios (SMR) 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). To ensure that "like is compared with like" across the diversity of hospitals, potentially confounding factors (factors that may directly influence the outcome) are adjusted for in the analysis, for example, patient age and the presence of other serious illnesses. SMR's do not allow hospitals to compare outcomes against one another, but they allow comparison against a national average.

Hospitals are using NQAIS NAHM to determine the effectiveness of care provided to patients. Four hospitals' reviews on their mortality data are included in this report and they identify opportunities for shared learning.

This is the second report from NAHM and both the tool and audit continue to be refined. To identify areas for improvement, an evaluation of use of NQAIS NAHM was carried out by NOCA. This study showed that 89% of hospitals surveyed presented their mortality data at hospital executive level during 2016. The study highlighted triangulation with other indicators of quality of care within hospitals and relevant national data sources as an area for improvement. This is included as a recommendation.

NQAIS NAHM and the NAHM audit continue to evolve in line with international developments and advances in the web based tool. There are enhancements to the NQAIS NAHM tool scheduled for implementation in 2018 including: improvement of the functionality and appearance of the display, allow users to view changes since the last update, bookmark and lookback features.

KEY FINDINGS

CARDIOVASCULAR KEY DIAGNOSES

Acute myocardial infarction (AMI): Between 2007 and 2016, the national in-hospital mortality rate following admission with AMI showed a significant (40%) reduction. In 2016, one hospital had an SMR which was outside the expected range for AMI and this has been reviewed by the hospital.

The Healthcare Pricing Office (HPO) is consulting with the National Centre of Classification in Health (NCCH) at The University of Sydney who support and develop the Australian Coding Standards and are also working with the Clinical Care Programmes, to clarify the guidelines for sequencing of coding of AMI patients.

Heart failure: Between 2007 and 2016, the national in-hospital mortality rate following admission with heart failure showed a small but significant reduction. In 2016, all hospitals had an SMR within the expected range for heart failure.

Ischaemic stroke: Between 2007 and 2016, the national in-hospital mortality rate following admission with ischaemic stroke showed a significant (36%) reduction. In 2016, one hospital had an SMR outside the expected range for ischaemic stroke and this has been reviewed by the hospital.

Haemorrhagic stroke: Between 2007 and 2016, the national in-hospital mortality rate following admission with haemorrhagic stroke did not show a significant reduction. Between 2014 and 2016, all hospitals had an SMR within the expected range for haemorrhagic stroke.

RESPIRATORY KEY DIAGNOSES

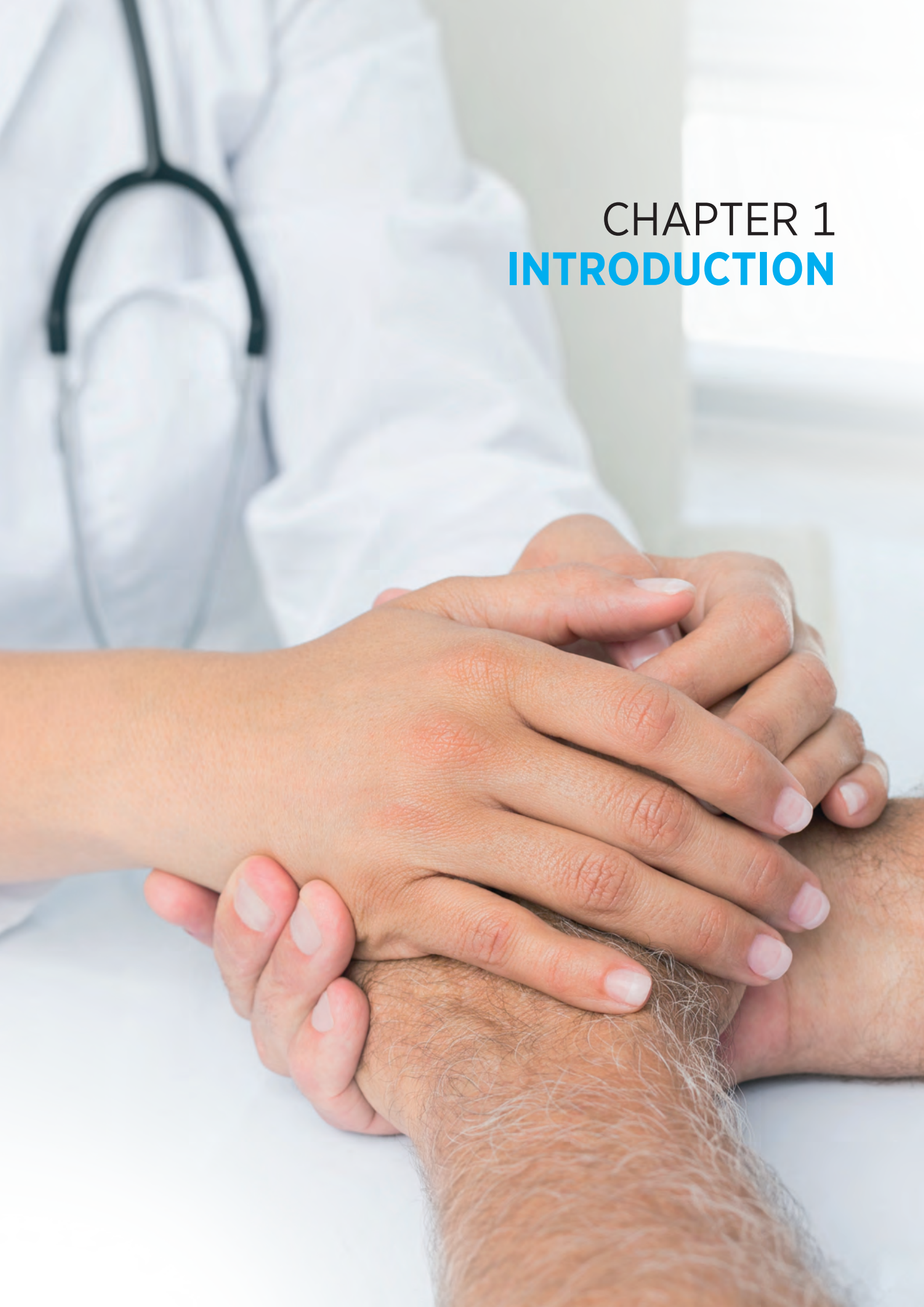
Chronic obstructive pulmonary disease (COPD): Between 2007 and 2016, the national in-hospital mortality rate following admission with COPD showed a small but significant reduction. In 2016 all hospitals had an SMR which was within the expected range for COPD.

Pneumonia: Between 2007 and 2016, the national in-hospital mortality rate following admission with pneumonia showed a small but significant reduction. In 2016 all hospitals had an SMR which was within the expected range for pneumonia.

Documentation and coding of principal diagnosis remains a challenge as identified in the hospital review summaries contained in this report.

KEY RECOMMENDATIONS

- Increased collaboration between clinicians and clinical coders (or where available coders assigned to a speciality) will improve the quality of medical records and coding of hospital data in the Hospital In-Patient Enquiry system (HIPE).
- NAHM should be used by clinicians, hospital managers and their boards as a quality improvement tool for the targeted review of hospital mortality patterns.
- Hospitals should always triangulate NAHM to other data sources within their hospital and other national data collections. This can include a broader context of quality tools, such as patient experience and complaints, staff feedback and safety incident reporting.
- 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 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 speciality clinical code in NQAIS NAHM.
- 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.
- 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.
- The possibility of an illness severity score within the NQAIS NAHM tool should be explored by the NAHM Governance Committee.



CHAPTER 1
INTRODUCTION

CHAPTER 1

INTRODUCTION

WELCOME TO THE SECOND NATIONAL AUDIT OF HOSPITAL MORTALITY (NAHM) ANNUAL REPORT

There are many predictors of quality of care for a hospital. Mortality is one such measure. It is not possible to get a complete picture of a hospital's quality of care from mortality data alone. NOCA continues to encourage hospitals to look at a range of quality indicators available to them and not to consider NAHM data in isolation. NQAIS NAHM is a valuable tool which produces alerts pointing to areas of possible concern where a hospital is at variance with the national average and where a review of their data is warranted.

NAHM is live in 44 publicly funded hospitals in Ireland (Figure 1). Deployment occurred throughout 2015 and was completed in 2016.

NOCA continues to advocate for transparency in mortality reporting and publishes hospital level data for NAHM. This years report includes an additional diagnosis under the respiratory speciality - pneumonia, a report on a survey evaluating the use of NAHM and a look to the future of NAHM.

There has been continued commitment to NAHM from hospitals in the past year with engagement and willingness to participate extremely positive. Three hospitals conducted reviews in line with NOCA's Monitoring and Escalation Policy and a summary of their reports are included elsewhere in this report. These reviews have resulted in quality improvement journeys for the hospitals involved and NOCA thanks them for sharing their learnings.

Additional information is available from www.noca.ie to support this report. This includes a summary report in a user friendly and plain format and hospital level technical analysis.

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

PURPOSE OF THIS REPORT

The purpose of this report is to assure patients, families, the public and the wider health system that hospital mortality is continuously monitored and that structures exist to investigate areas of potential concern and implement improvements as required. Hospitals receive quarterly NAHM updates that they use on an on-going basis to monitor their expected mortality ranges and to trigger prompt investigation of areas of concern.

An analysis of hospital mortality for the following diagnoses are presented in this report:

1. acute myocardial infarction (AMI)
2. heart failure
3. ischaemic stroke
4. haemorrhagic stroke
5. chronic obstructive pulmonary disease (COPD)
6. pneumonia

This analysis of hospital mortality is calculated using each patient's unique profile that takes into account the following variables;

- age
- gender
- pre-existing illness (Charlson comorbidity index)
- 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 that each patient is unique. For example patients conditions can vary, while patients may also respond differently to treatment e.g. surgery, medications.

WHAT THIS REPORT CANNOT DO

Hospitals can view their own data in relation to a national average. 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 e.g. hospitals such as specialist referral centres may only admit patients with more complicated conditions. This report cannot and should not be used to produce league tables or compare hospitals.

This report cannot be used to compare hospitals.

UPDATE ON RECOMMENDATIONS FROM NAHM REPORTS IN 2016

NOCA works to promote an open culture of shared learning to improve clinical outcomes and patient safety. To support this, NOCA works with key stakeholders to ensure that recommendations arising from NOCA national clinical audit reports are implemented. With approval of the NOCA Governance Board, NOCA presented key recommendations arising from all NOCA national reports published in 2016 to stakeholders within the HSE. With their support, recommendations were aligned to key implementation leads in 2017. An update on progress of key NAHM recommendations is presented in Table 1.

NAHM IN HOSPITALS

NOTE: Dublin Hospitals have been displayed collectively by hospital group

SAOLTA UNIVERSITY HEALTHCARE GROUP
Galway University Hospitals
Letterkenny University Hospital
Mayo University Hospital
Portiuncula University Hospital
Roscommon University Hospital
Sligo University Hospital

RCSI HOSPITAL GROUP
Beaumont Hospital
Cavan General Hospital
Connolly Hospital
Louth County Hospital, Dundalk
Monaghan Hospital
Our Lady of Lourdes Hospital, Drogheda

IRELAND EAST HOSPITAL GROUP
Cappagh National Orthopaedic Hospital, Dublin
Mater Misericordiae University Hospital
Regional Hospital Mullingar
Our Lady's Hospital, Navan
Royal Victoria Eye and Ear Hospital, Dublin
St. Columcille's Hospital, Loughlinstown
St. Luke's General Hospital, Kilkenny
St. Michael's Hospital, Dun Laoghaire
St. Vincent's University Hospital
Wexford General Hospital

DUBLIN MIDLANDS HOSPITAL GROUP
Midland Regional Hospital Portlaoise
Midland Regional Hospital Tullamore
Naas General Hospital
St James's Hospital, Dublin
Tallaght Hospital (Adult)

UL HOSPITAL GROUP
Croom Hospital
Ennis Hospital
Nenagh Hospital
St John's Hospital, Limerick
University Hospital Limerick

NATIONAL CHILDREN'S HOSPITAL GROUP
Our Lady's Children's Hospital Crumlin
Tallaght Hospital (Paediatrics)
Temple Street Children's University Hospital

SOUTH / SOUTH WEST HOSPITAL GROUP
Bantry General Hospital
Cork University Hospital
Kilcreene Regional Orthopaedic Hospital
Mercy University Hospital
Mallow General Hospital
South Infirmary Victoria University Hospital
South Tipperary General Hospital
University Hospital Kerry
University Hospital Waterford

FIGURE 1: NAHM IN HOSPITALS

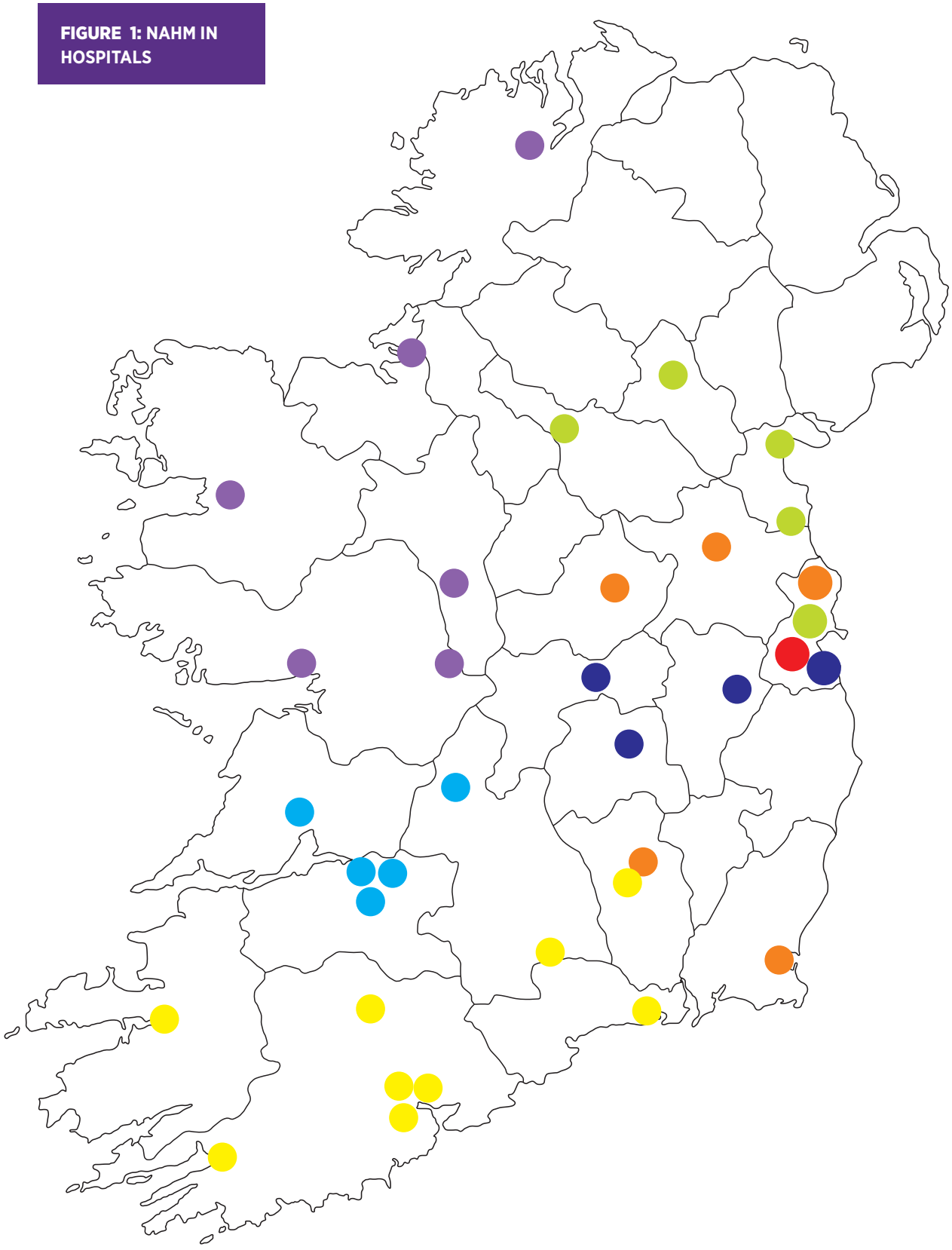
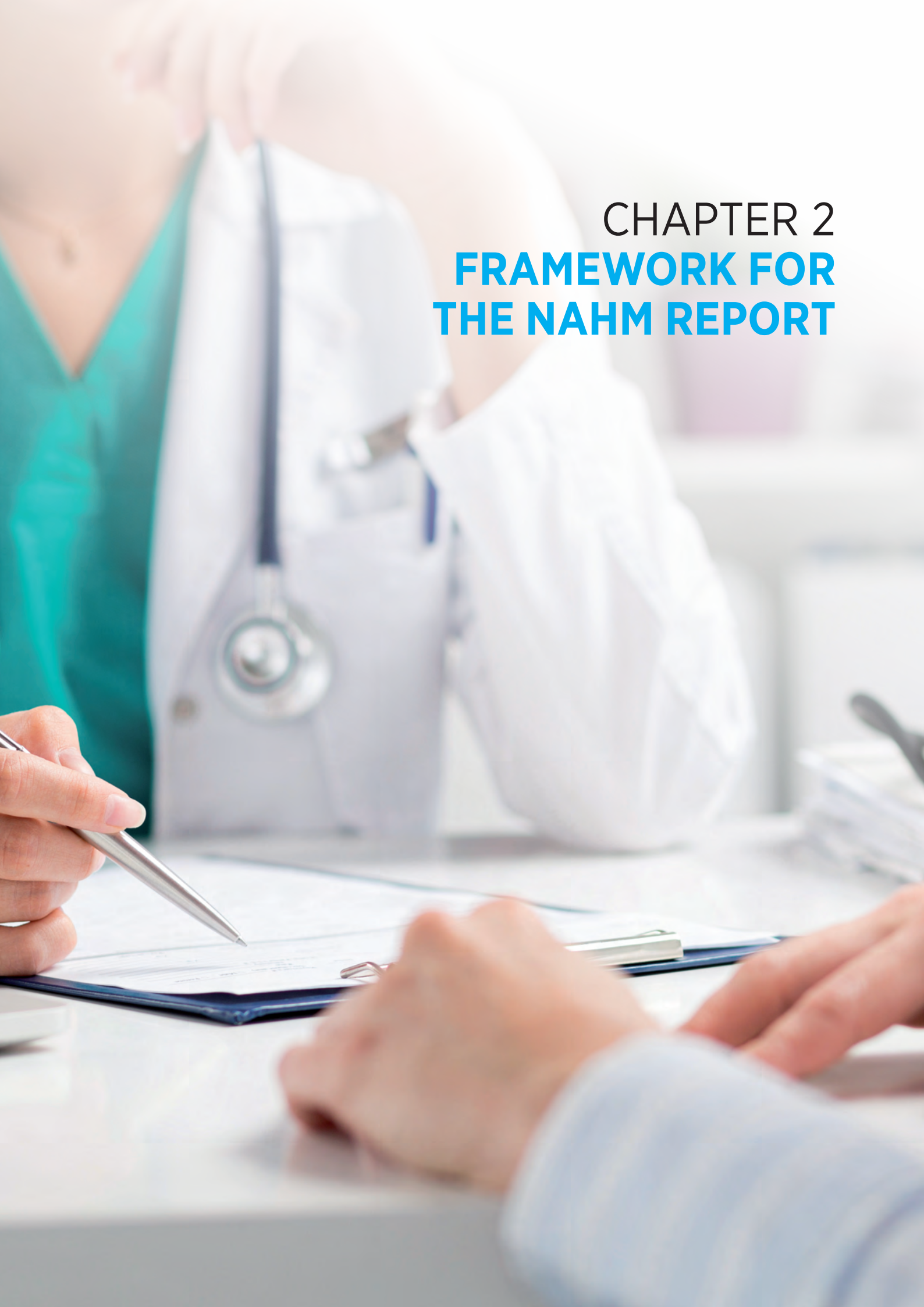


TABLE 1: SUMMARY PROGRESS UPDATE ON NAHM RECOMMENDATIONS 2016

Recommendation	Key Development Leads	Summary Progress Update	Accountable for implementation	Status
A patient discharge summary should be completed for every in-hospital mortality, to further improve the accuracy of HIPE data.	HPO, NOCA	NOCA to collaborate with HPO to carry out assessment survey on use of discharge summaries. This will inform next steps.	Hospitals Hospital Groups	In progress
Continued and increased collaboration between clinicians and clinical coders will improve the quality of the recording and coding of hospital data.	HPO, NOCA	NOCA to work with HPO to organise a promotional campaign of clinicians working with clinical coders through newsletters, conferences through HSE, National Clinical Care Programmes.	Hospitals Hospital Groups	Planning will start in Q4 2017 with implementation throughout 2018
NAHM should be used by clinicians, hospital managers and their boards as a quality improvement tool for the targeted review of hospital mortality patterns.	HSE Acute Hospitals Division, NOCA	Development of a governance checklist which can be used for quality assurance purposes by hospitals. HSE Acute Hospitals 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.				
NAHM should evolve in response to feedback from key stakeholders (such as COPD and stroke).	HSE National Clinical Care Programmes, NOCA	NOCA engagement with: • HSE National Clinical Programme for COPD - No change to classification of COPD in NAHM. • HSE National Clinical Programme for Stroke - Changes to Haemorrhagic Stroke in NAHM (further detail on Page 57).	NOCA	Completed
Future NAHM reports should be expanded to include other less common disease categories, where sufficient volume of data is present to support the statistical result.	NOCA	• NOCA have included key diagnosis based on clinical and methodological criteria in 2017. Cohort of key diagnoses expanded to include pneumonia. • Will be reviewed annually by NAHM Governance Committee. • All hospitals receive local reports.	NOCA	Completed for 2017



CHAPTER 2
FRAMEWORK FOR THE NAHM REPORT

CHAPTER 2

FRAMEWORK FOR THE NAHM REPORT

The NAHM Governance Committee applied inclusion criteria to select a cohort of key diagnoses as shown in Table 2.

TABLE 2: CRITERIA FOR SELECTION OF KEY DIAGNOSES

	CRITERIA	COMMENT	RATIONALE
CLINICAL	**Alignment to Clinical Care**	Is there an aligned HSE Clinical Care Programme?	HSE Clinical Care 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 e.g. high mortality?	
METHODOLOGICAL	**Definition**	Is the 'key diagnosis' clearly clinically defined?	Only key diagnoses which are explicitly defined are selected for reporting.
METHODOLOGICAL	**No. of hospitals with defined number of admissions and expected events**	Volume of expected deaths ≥5? 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**	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.

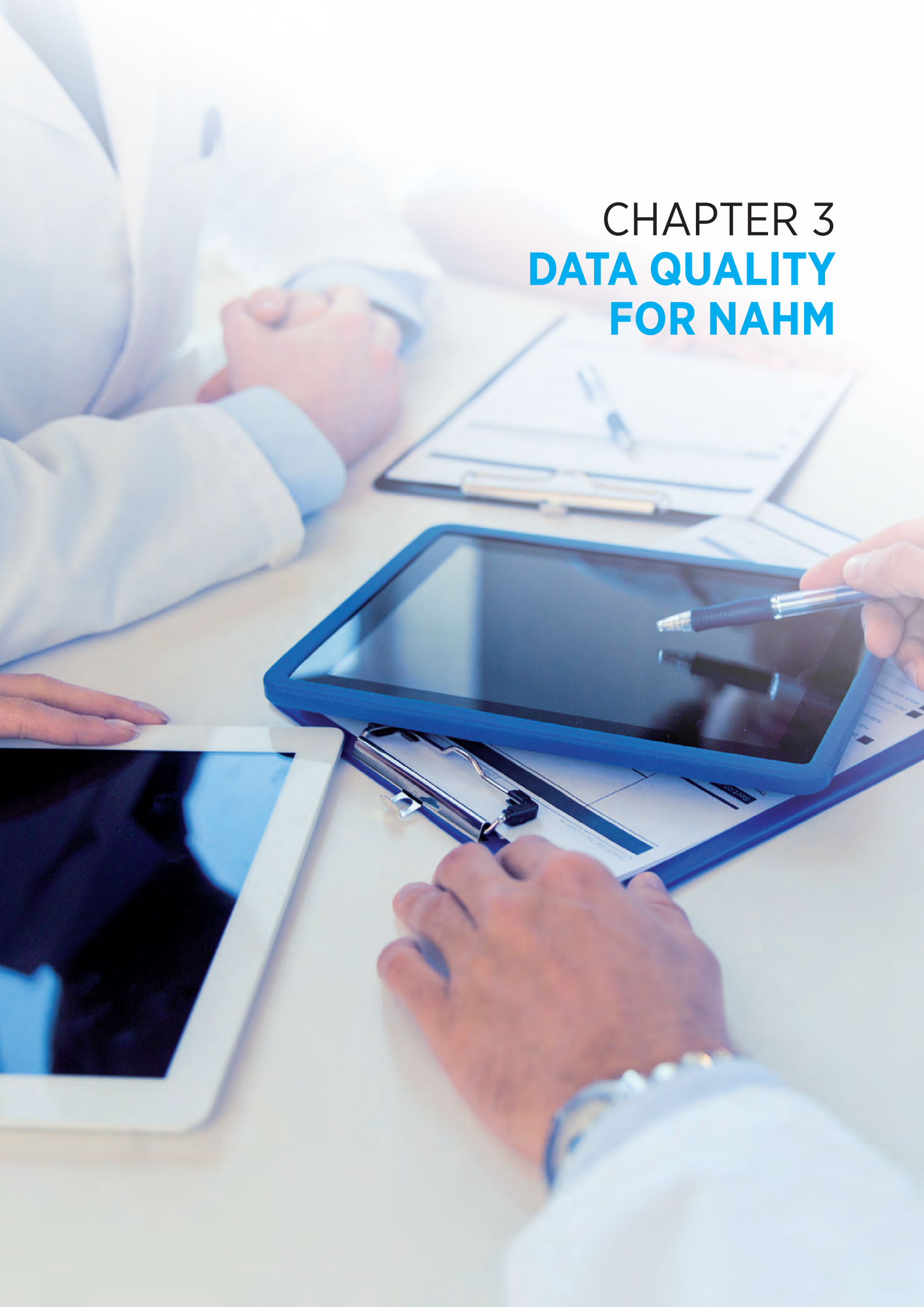
Applying these criteria, the following key diagnoses are reported on:

- AMI
- ischaemic stroke
- COPD
- heart failure
- haemorrhagic stroke
- pneumonia

PRESENTATION OF MORTALITY DATA IN THIS REPORT

NAHM data was analysed across the key diagnoses as follows:

- Crude national in-hospital mortality rate from 2007 to 2016. This is presented in a line / trend chart.
- National in-hospital SMR for 2016, with the exception of haemorrhagic stroke, which is presented over a three year time period, 2014-2016. This is presented in a funnel plot.
- In-hospital mortality figures for 2016, with the exception of haemorrhagic stroke, which is presented over a three year time period, 2014-2016, presented in table format.
- Commentary from National Clinical Care Programmes.
- Reports from hospitals with statistical outliers have been included in this report to demonstrate learning and improvement coming from NAHM.



CHAPTER 3
DATA QUALITY FOR NAHM

HIPE DATA SOURCE FOR NQAIS NAHM

Hospital mortality patterns are generated internationally by the use of routinely collected clinical and administrative data on patients discharged from hospital. In Ireland, this data is collected from publicly funded hospitals by the HIPE system which is managed by the HPO on behalf of the HSE. Hospital HIPE data is comprised of data extracted from hospital patient administration systems and the patient medical record. HIPE clinical coders extract, code and enter the data from the patient medical record (including discharge summary) into the standardised HIPE Portal data entry system. The HPO supports the use of HIPE in hospitals.

The HPO provides anonymised HIPE data to NQAIS NAHM, where it is analysed to provide NAHM outputs, such as the SMR. SMRs are analysed based on the principal diagnosis of the patient recorded in HIPE; 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). It does not follow that the principal reason for their hospitalisation is always the reason for their death.

Data can be considered of good quality when the correct reliable data is available in a timely manner. Hospitals return encrypted and secure HIPE exports to the HPO on a monthly basis and a new national file is created each month to include these updates. In 2016, data on 99.9% of all in-patient discharges was returned to the HPO, Table 3.

TABLE 3: NATIONAL HIPE DATA COVERAGE

YEAR	COVERAGE (%)
2014	97%
2015	99.8%
2016	99.9%

Each hospital uses the same HIPE data entry system so all data is subject to the same data entry and edit checks. HIPE data quality activities occur before, during and after HIPE data entry. Data entry edits and checks ensure a high standard of data before being exported to the HPO. Many hospitals, with the support of the HPO, perform regular checks on HIPE data to ensure their own high standards of accuracy. The key to ensuring accurate HIPE data is that there is a complete and accurate medical record, including discharge summary, which is then completely and accurately coded. A patient discharge summary should be completed for every in-hospital mortality (this is currently not routinely the case), which will further improve the accuracy of HIPE data (HIQA, 2013). The HPO works to ensure this through a continuous improvement cycle involving: clinical coder training and support, audit and review, data validation and HIPE software systems. The HPO commissioned an independent review of HIPE in 2015 which acknowledged the overall quality of HIPE data, but noted a need to develop a national data quality improvement agenda that reduces variations in coding practice between the hospitals (Pavilion Health Australia, 2016).

The HPO continue to review their guidelines and have sought guidance on the use and sequencing of the ICD-10-AM clinical coding classification where a patient has a Myocardial Infarction and is found to have Coronary Artery Disease. Clear guidelines are not available on this issue and the HPO are working closely with NCCH in Australia. Further detail is presented in Appendix 4.

NQAIS NAHM uses HIPE data to generate mortality patterns and SMR's for hospitals. Both clinicians and clinical coders in hospitals and the HPO work to ensure that the data is accurate to reflect both the reason for and process of in-patient care. If there is limited interaction between clinicians and clinical coders, there is increased potential for misunderstanding and misinterpretation of data. In NAHM's first report last year a recommendation was made for continued and increased collaboration between clinicians and clinical coders which will improve mutual understanding, along with the quality of medical records and coding of hospital HIPE data (NOCA, 2016). With an increased focus on the implementation of activity based funding (ABF), this recommendation is reiterated in the review of national HIPE data (Pavilion Health Australia, 2016).

To improve the quality of data in NQAIS NAHM, NOCA is currently working with the HPO to action the following recommendations made in last year's report:

- A patient discharge summary should be completed for every in-hospital mortality, which will further improve the accuracy of HIPE data.
- Continued and increased collaboration between clinicians and clinical coders will improve the quality of the recording and coding of hospital data.

Hospital reviews carried out on statistical outliers in AMI, ischaemic stroke and pneumonia in this report show that identifying the correct principal diagnosis can be a challenge. From these reviews it is recommended that clinicians should work with HIPE Managers and clinical coders (or where available coders assigned to a speciality) to ensure the quality of hospital data.

PALLIATIVE CARE

Palliative care is defined as an approach that improves the quality of life of patients and their families facing the problems associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial and spiritual (HSE National Clinical Programme for Palliative Care, 2017a). Palliative care may therefore be understood as both a set of principles that underpins an approach to care, and as a type of specialist service that is provided.

Historically, many people thought of palliative care as care provided at the very last stage of life, around the time of death. However, in the last twenty years, the scope of palliative care has broadened to providing palliative care at an earlier stage in the disease trajectory. In this model of integrated palliative care provision, palliative care is not dependent on prognosis and can be delivered at the same time as interventional treatment. While the broader definition is far from the original idea of 'terminal' or 'end of life' care, it does still include it. Patients coded in HIPE for palliative care have a potentially greater risk of in-hospital death than patients not coded for palliative care.

Palliative Care in NAHM

The inclusion of the palliative care code is an important variable in the context of the NQAIS NAHM model for calculating the SMR. The palliative care code and its relationship to the principal diagnosis are weighted in the model calculation. The palliative care code is captured in NAHM via the HIPE file where palliative care is present as an additional diagnosis. There is only one code in ICD-10-AM for palliative care, Z51.5, and it does not differentiate between patients receiving specialist palliative care input (at any stage of their illness) and patients receiving an approach to care where the sole focus is on comfort care (i.e. patients for whom the intent of care is 'for palliation' regardless of whether they have been seen by the specialist palliative care team or not).

> **Irish Coding Standard 0224** *Palliative care* provides guidance on the use of code Z51.5 Palliative care and 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.* (HPO, 2016).

Initially it was proposed that the NAHM model would exclude HIPE records of patients who had palliative care; Z51.5 code assigned as an additional diagnosis. The NAHM Governance Committee approved inclusion of these patients following a review carried out by the Health Intelligence, Health and Wellbeing (HIU) HSE, (Robinson, 2016).

Hospitals can identify when the palliative care code has been applied via additional diagnoses record lists on HIPE and subsequently in NAHM. Table 4 shows analysis of admissions for a diagnosis where the palliative care code has been applied and deaths in that diagnosis which had a palliative care code applied in 2016. These figures are potentially reflective of variations in hospitals applying the palliative care code but as the code is so broad it is very difficult to currently draw any further conclusions. While there always remains the possibility that this code may be added inappropriately, the risk of this can be reduced by monitoring and making the rates of palliative care coding transparent (NOCA, 2016). NOCA will continue to monitor its use in NAHM.

TABLE 4: NATIONAL RATE OF PALLIATIVE CARE CODE APPLICATION 2016

Diagnosis	Palliative Care Code Application All Admissions	Palliative Care Code Application Deaths
AMI	2%	27%
Heart Failure	5%	41%
Ischaemic Stroke	6%	43%
Haemorrhagic Stroke	6%	30%
COPD	4%	45%
Pneumonia	8%	41%

HIPE Palliative Care Code Review

In 2017, the HPO conducted a review of the application of palliative care code. Five hospitals, where a chart based coding audit was underway, were audited for this review. It showed that the application of the code was in line with the Irish Coding Standard 0224-Palliative Care. NOCA will continue to work with the HPO to monitor this in NAHM.

Discussion

The application of the palliative care code is broader than end of life care. Palliative care can be provided to people at any stage of their illness. The aim is to enhance quality of life and, wherever possible, to positively influence the course of their illness (HSE National Clinical Programme for Palliative Care, 2017a).

Through interactions with hospitals, NOCA has observed that the interpretation of the palliative care code can be different from hospital to hospital and even within a hospital. The clinical speciality code on HIPE is not taken into consideration in NAHM. If included it would possibly help to distinguish between those who are admitted for palliative care during the course of their illness and those who have been admitted for treatment, deteriorated and have received palliative care at a later stage of their episode of care. The inclusion of the clinical speciality code in NAHM should be examined.

HSE, NATIONAL CLINICAL PROGRAMME FOR PALLIATIVE CARE

The HSE National Clinical Programme for Palliative Care welcomes NOCA's work and inclusion of the palliative care code within NAHM. It is important to explore the separating out of the current two different indications for using the palliative care code as it is not possible to do this with the current coding structure. The programme supports the recommendation to look into the possibility of more detailed information.

MORTALITY DATA IN NAHM

This report presents crude mortality data for each diagnosis from 2007 - 2016 (in the relevant clinical chapter). Figure 2 presents changes in the crude mortality rate combined with a change in the number of hospital admissions over the same time period. This suggests a general reduction in mortality rate. It is important to note that Figure 2 has not been adjusted for differences in age profile or comorbidities, nor take account of potential consequences of changes in lifestyle and behaviours, but assumes similar case-mix of patients over 2007-2016.

FIGURE 2: RELATIVE CHANGE IN NUMBERS OF ADMISSIONS AND MORTALITY RATES 2007 – 2016

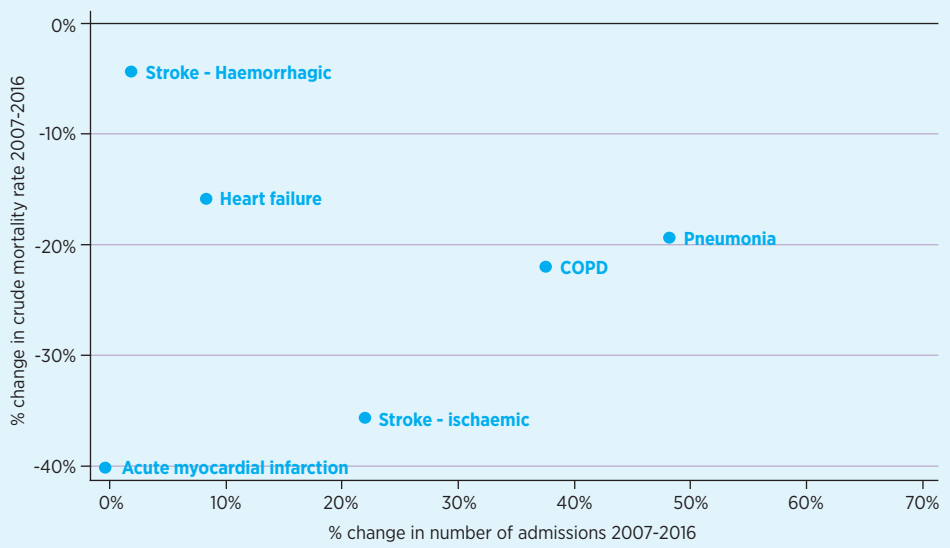


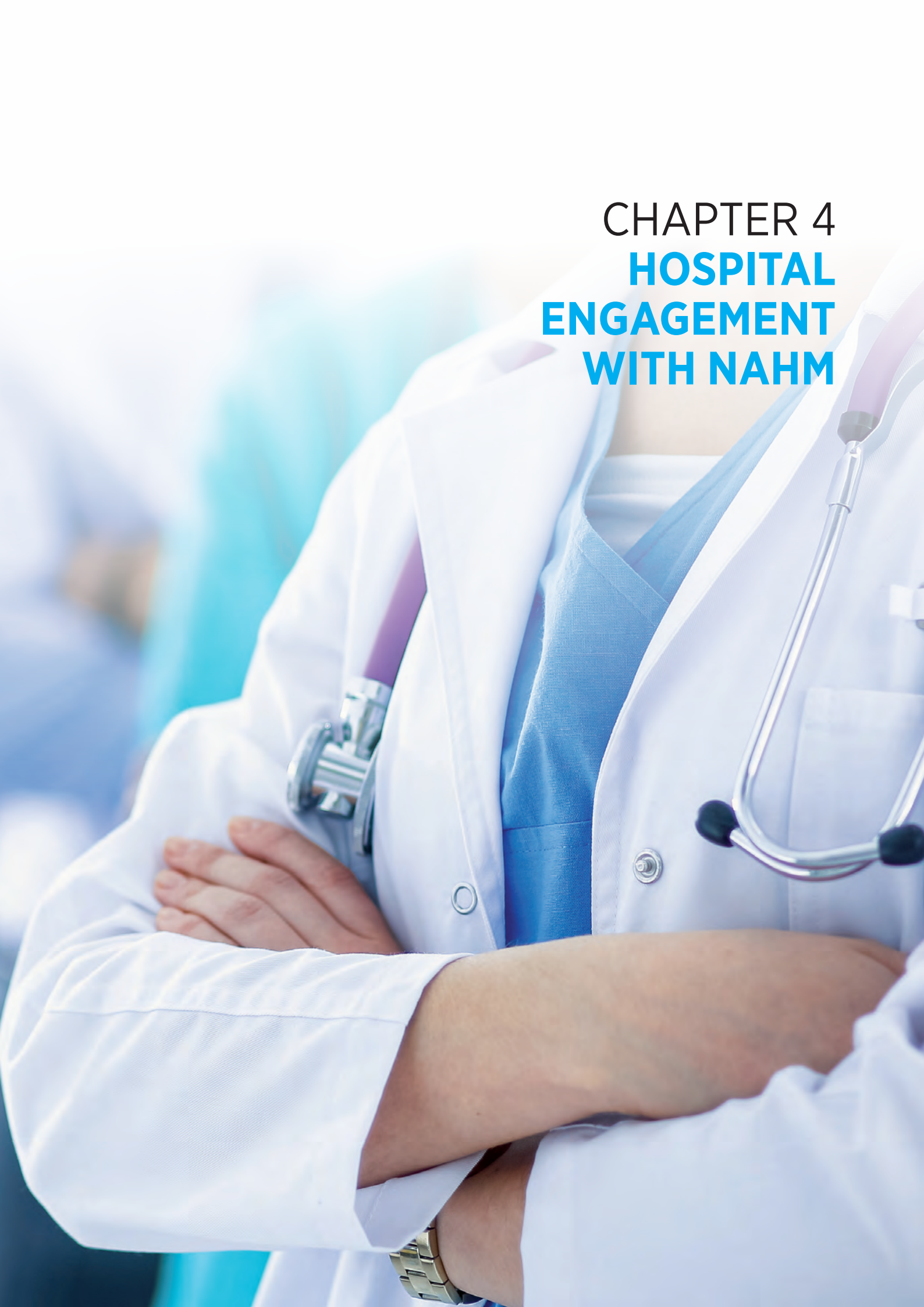
Figure 2 shows :

- 49% increase of hospital admissions for pneumonia with a 20% reduction in crude mortality rate.
- 38% increase in hospital admissions for COPD with a 22% reduction in crude mortality rate.
- 22% increase in hospital admissions for ischaemic stroke with a 36% reduction in mortality rate.
- 8% increase in hospital admissions for heart failure with a 16% reduction in crude mortality rate.
- 2% increase in hospital admissions for haemorrhagic stroke with a 4% reduction in crude mortality rate.
- 0.2% reduction in hospital admissions for AMI with a 40% reduction in crude mortality rate.

This is worthy of a more in-depth review and it is recommended that the NAHM Governance Committee commission a research study to fully understand these findings.

Recommendations

- Hospital clinicians should work with HIPE Managers and clinical coders (or where available coders assigned to a speciality) to assure the quality of hospital data.
- 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 clinical speciality code in 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 the HPO on use of the palliative care code.
- 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.



CHAPTER 4
HOSPITAL ENGAGEMENT WITH NAHM

HOSPITAL ENGAGEMENT WITH NAHM MONITORING DATA IN HOSPITALS

The primary purpose of NOCA is to establish sustainable infrastructure, governance and monitoring of clinical audit at national level which will ultimately improve outcomes for patients in Irish hospitals. NOCA promotes that NAHM is used as part of a wider suite of quality indicators and should always be used in conjunction with other hospital quality indicators and listening to staff and patients in order to identify potential learning opportunities to improve clinical care (NOCA, 2016). One example of good practice from a hospital is as follows:

BEAUMONT HOSPITAL

The data generated from NAHM has proven to be extremely beneficial to the Hospital. The Hospital now trends its SMRs, mortality rates and CUSUM breaches per quarter. We carry out desk-top and/or chart reviews on all CUSUM breaches and any statistical outliers; these reviews continue to reassure and inform us of the effectiveness of care to our patients. To ensure transparency and oversight, all reports are presented at the Hospital Clinical Governance Committee and onwards to Executive Management Team and to the Hospital Board.

Professor Edmond Smyth
Director of Clinical Governance
Beaumont Hospital

Variation in mortality patterns may be explained by:

- random (statistical) variation
- differences in patient characteristics
- issues of data quality
- aspects of the quality of care

It is important that data, which is the responsibility of individual hospitals, is examined and validated locally. Data quality depends on the accuracy and depth of chart documentation and coding. NOCA has recommended continued and increased collaboration between clinicians and coders to improve the quality of medical records and the recording and coding of hospital data (NOCA, 2016).

Statistical Outliers

The NAHM Governance Committee defined NAHM statistical outliers as occurring where a hospitals' SMR is high and appears outside control limits at 99.8% (one chance in five hundred). NOCA will only engage if the signal has stabilised, i.e. it occurred in the previous release of updated data and is still present. Data is updated to NAHM quarterly and this data is up to three months in arrears.

A finding of a statistical outlier does not in the first instance indicate that a hospital is providing poor quality of care, but rather a difference between the expected value and a result that is unlikely to have arisen from random variation alone. Further investigation may be warranted and this should trigger analysis and review in the hospital.

A hospital which has a high SMR and is outside of control limits at 99.8% will be contacted by NOCA requesting a review to be carried out in accordance with NOCA Monitoring and Escalation Policy. Participating hospitals are responsible to carry out these reviews (NOCA, 2017a). Reviews should start with a data quality assessment followed by a review of case-mix, processes and structures of care (Lilford, 2004). To support hospitals, NOCA should consider undertaking the development of guidance on a standardised approach to review NAHM findings, enabling a consistent follow-up and report process. This will be considered by the NAHM Governance Committee. NOCA shares the key learnings arising from these reviews in published national reports (NOCA, 2017a).

Hospital feedback on monitoring data

In the first NAHM Annual Report, Mater Misericordiae University Hospital (MMUH) were identified as a statistical outlier in COPD for 2015. They conducted a review of their data which did not raise any immediate concerns. NOCA and the MMUH continued engagement throughout the year and the review has now concluded, a summary can be found below:

MATER MISERICORDIAE UNIVERSITY HOSPITAL SUMMARY REVIEW OF 2015 COPD DATA

The elevated standardised mortality ratio for COPD for 2015 was reviewed and monitored throughout 2016.

The SMR is still a relatively new tool and much of the learning can only become apparent by its use and interrogation by the various stakeholders. We have been encouraged by NOCA and have subsequently spent much time interrogating the data to verify its accuracy, consistency and completeness. This had led to systematic reviews of the HIPE data, consultant reviews of patient healthcare records and opportunities for learning within the hospital.

A number of clinical care reviews have been undertaken in the last year. It was acknowledged early in the process that carrying out these reviews required a systematic approach, and so following review of international mortality screening tools, the hospital developed its own a 'Mortality Screening Tool'. Using this tool, we initially carried out a series of internal chart reviews at consultant level to ascertain if there was a clinical issue with the management of a diagnosis of COPD. The review did not find concerns with the management of patients with COPD, however it was identified that the clarity within the documentation as to the principal diagnosis was at times difficult for HIPE coders to interpret in the context of multiple co-morbidities. We also sought external clinical expertise on our findings. This approach has enabled us to provide assurance to the hospital on the quality of care provided.

Following consultant review of patient healthcare records with respect to those with a principal diagnosis coded as COPD, it was evident that a number of these patients had presented with pneumonia with existing COPD, however, COPD was coded as their principal diagnosis. The principal diagnosis requiring treatment

was the pneumonia with COPD as a co-morbidity.

Other learning from the reviews led to engagement with our Consultant in Specialist Palliative Care to consider how best to reflect within the coding the complexity of patients whom are identified as reaching end of life and whose care is managed by their primary consultant without specialist palliative care input. In MMUH, patients are coded as palliative as per the Irish Coding Standard (ICS 0224) for palliative care. The code Z51.5 is to be coded when there is documentation that the patient has been seen or attended to by the palliative care team as the phrase 'for palliation' may not be used (HPO, 2016). We believe there are some inconsistencies in its use nationally and guidance is required from the National Clinical Programme for Palliative Care to standardise use of the code.

We have continued to monitor the NAHM SMR data issued quarterly through NOCA, a number of consultants have carried out clinical chart reviews covering diagnosis such as, urosepsis, biliary tract disease and AMI. The number of deaths within each diagnosis is small and the accuracy in the capturing of the principal diagnosis is crucial to providing consistent information for data quality and for the provision of an accurate SMR. The learning from the many systematic reviews indicated that the interpretation of coding of the principal diagnosis from the clinical notes is challenging due to the complexity of presenting symptoms and existing co-morbidities. Improvements are in progress in documentation by Clinicians to provide greater clarity as to the principal diagnosis in the context of multiple existing co-morbidities.

The hospital values the capacity of this tool to enable audit of mortality within the hospital. It is viewed as a key indicator of the quality of clinical care provided. As part of our governance of the mortality within the hospital, the SMR is reviewed at the Quality and Patient Safety Steering committee and reported to the Board as part of the Board Quality Dashboard.

Mr Gordon Dunne
Chief Executive Officer
Mater Misericordiae University Hospital

Conclusion

This chapter presents information on how hospitals engage with their data on a day to day basis or when statistical outliers are identified.

NOCA engages with hospitals when they are outside of control limits at 99.8%. One of the aims of NAHM is to identify areas for improvement and to assist hospitals. NAHM data is also presented at local hospital level showing a more liberal 95% control limit band. Hospitals are encouraged to monitor signals which are in this 95% band and conduct internal investigations to identify the reason and put an action plan in place to deter it becoming a potential statistical outlier.

CHAPTER 5
EVALUATION OF USE OF NAHM

CHAPTER 5

EVALUATION OF USE OF NAHM

BACKGROUND

One of the objectives of NAHM is to understand and improve the quality of hospital based mortality data. How the NQAIS NAHM tool is used within the hospital system can assist in this understanding, not only of data, but also as an indicator of quality of care in a hospital.

NOCA seeks to ensure transparency of process and learning from NAHM deployment through seeking feedback from hospitals. The NAHM Governance Committee approved a proposal for evaluation of use of NAHM by hospitals, hospital groups and hospital boards in January 2017.

Objective of study

- To collate information on the use of NAHM in 2016 at hospital, hospital group and board level.
- To share learnings and make recommendations on use of the NQAIS NAHM tool.

METHODS

Structured telephone interviews were employed to collect data. All interviews were conducted by the NAHM Audit Coordinator. The NAHM Governance Committee provided oversight for this evaluation study. A questionnaire was developed to collect information relating to the use of NAHM.

A purposive sampling methodology was used to collect data from hospitals, hospital groups, and hospital boards. A sample size of 60% of these respondents was selected. Data confidentiality was maintained, personal data i.e. names of interviewees, was not recorded at the time of interview. All data was securely maintained in locked NOCA offices and on an encrypted NOCA laptop. All data will be destroyed following completion of analysis.

Content validity of the tool was assured by peer review by users and NAHM Governance Committee members. To ensure reliability, pilot testing was also carried out. Both of these processes resulted in some minor changes. NOCA staff analysed data using descriptive statistical analysis and qualitative thematic analysis.

FINDINGS

Data quality

Data was collected between March and June 2017. Invitations to participate were sent to 19 respondents and there were 11 interviews carried out. This was an overall response rate of 58% as follows:

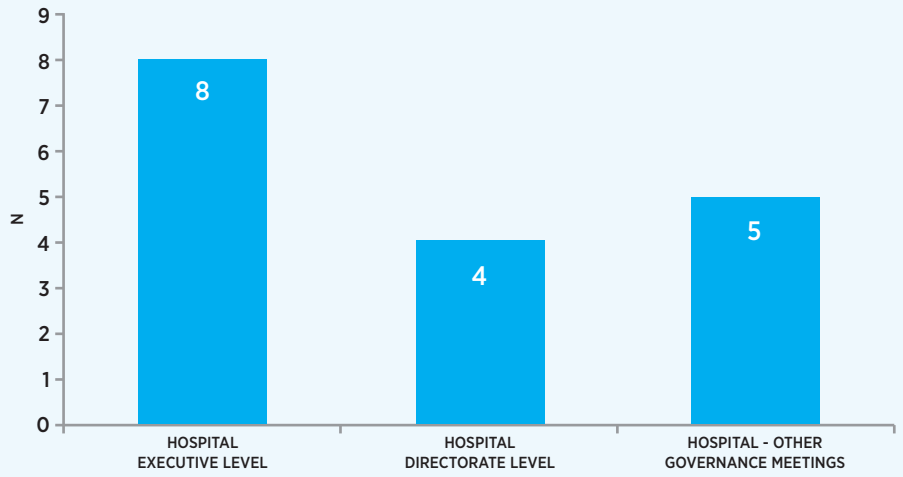
- Hospital Respondents – 9
- Hospital Boards – 2
- Hospital Groups – 0

Both quantitative and qualitative data was collected; all findings have been incorporated in the presentation of the findings.

Use of NAHM in hospital

Presentation of NAHM data is an indicator of awareness and use of the audit. There were nine hospital respondents and presentation of NAHM data at hospital level is presented in Figure 3.

FIGURE 3: PRESENTATION OF NAHM DATA IN HOSPITALS (N= 9)



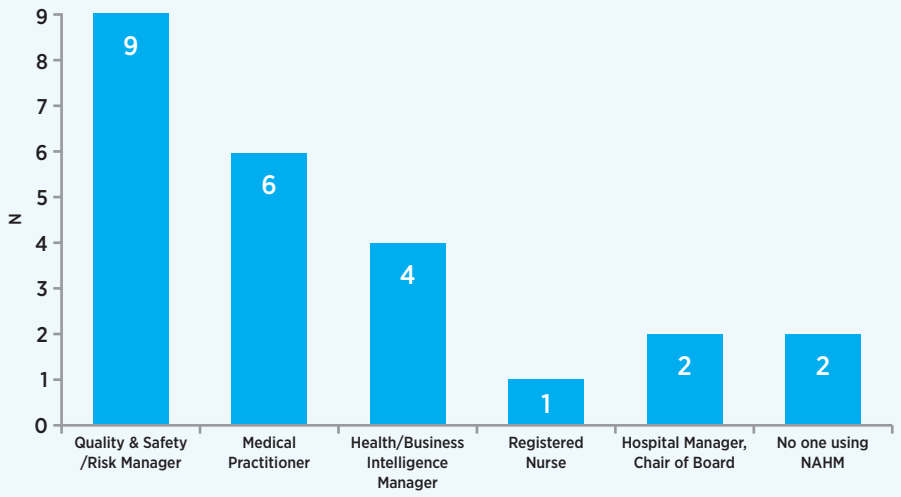
NAHM data was presented at the Hospital Executive Level Quality and Safety Committee in eight (89%) responses. The median number of annual meetings was three (Range 1-6 per annum). NAHM data was presented by senior hospital personnel – Hospital Managers, Quality & Safety Leads and Clinical Directors. One hospital reviewed NAHM at a clinical audit forum, which has a clinical and executive membership.

NAHM data was presented at the Hospital Directorate level Quality & Safety Committee in four (44%) responses. This was presented by Clinical Leads, Business Managers and by Quality & Safety Managers. Five (56%) respondents noted that NAHM was presented at other hospital fora such as clinical audit meetings, senior management teams and at group and board level. One hospital board respondent noted the presentation of

NAHM data at board meetings by the Hospital Quality and Safety Lead. NAHM was an agenda item 3-4 times per annum.

All Respondents were asked who used NAHM within their hospital or hospital board. This is presented in Figure 4.

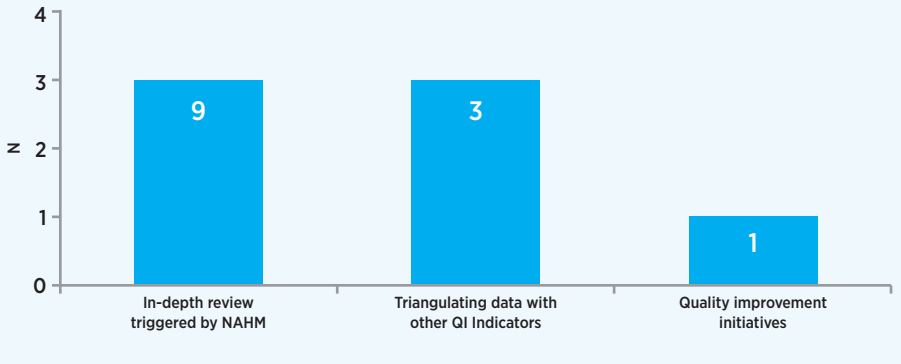
FIGURE 4: WHO USES NAHM? (N= 11)



NAHM is used by Quality and Safety Department / Risk Leads in nine (82%) cases, followed by Medical Practitioners in six (55%) and Health / Business Intelligence Managers in four (36%) cases. Two (18%) respondents noted NAHM was not being used.

How NAHM is actually being used in hospitals and at hospital boards is presented in Figure 5. The most common finding was use of NAHM for reviews and triangulation with other hospital data in three (27%) of cases. NAHM data was triangulated with other data coming from Stroke and Acute Myocardial Infarction registers, NOCA Irish National Intensive Care Unit Audit (ICU) and Major Trauma Audit and finally with Coroners' reports. NAHM data was used as an outcome measure with a hospital following service re-development.

FIGURE 5: HOW NAHM IS BEING USED? N= 11



DISCUSSION

Quality and safety governance is the system through which healthcare teams are accountable for the quality and safety of care they deliver. Recommendations from the NAHM Report included one relating to development of a governance structure that supports the active review and utilisation of NAHM data to monitor and improve patient care. 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, 2016). This recommendation is being reiterated in this NAHM report. These findings show NAHM is being used at a clinical level right through to the hospital board, evidenced by presentation of data at the governance structures in the hospital. Both senior clinicians and hospital managers are accessing NAHM data. This suggests that NAHM could broadly be used not only from clinical and quality perspectives but potentially also from a health intelligence perspective for service planning. This is useful information for those beginning their NAHM journey to ensure governance and accountability for quality of care amongst both frontline clinicians and senior healthcare leaders within the hospital system (HSE Quality Improvement Division, 2016).

SMRs provide a measure of the trend of the adjusted mortality in a hospital compared to the overall national trend. Data from the NQAIS NAHM tool is a starting point in identifying potentially higher than expected mortality within a hospital. It is an essential part of a wider quality assurance process where the aim is to focus on lessons learnt and spread good practice and improvement across the healthcare system. It is not a stand-alone measure (Hogan et al., 2015) and needs to be used in conjunction with other indicators covering safety, quality and performance. Findings from this initial engagement show this is an area for improvement, with only three (27%) respondents triangulating NAHM data with other sources. Where mortality signals are identified, this information should be cross–referenced with data from their quality indicators in a hospital. This will provide hospitals with a more holistic picture of quality of care.

Improving NAHM

Respondents were asked to identify potential improvements to the NAHM process. Suggestions relating to development of the model to incorporate more additional diagnoses and incorporation of greater flexibility in the reporting tool were put forward. These will be considered by the NOCA NAHM Governance Committee and, subject to agreement, referred to the NQAIS NAHM Analysis and Display Scientific Team for review and preparation of options. A mechanism for improvement of clinical engagement with data from the NQAIS NAHM tool is currently under exploration by NOCA.

Limitation

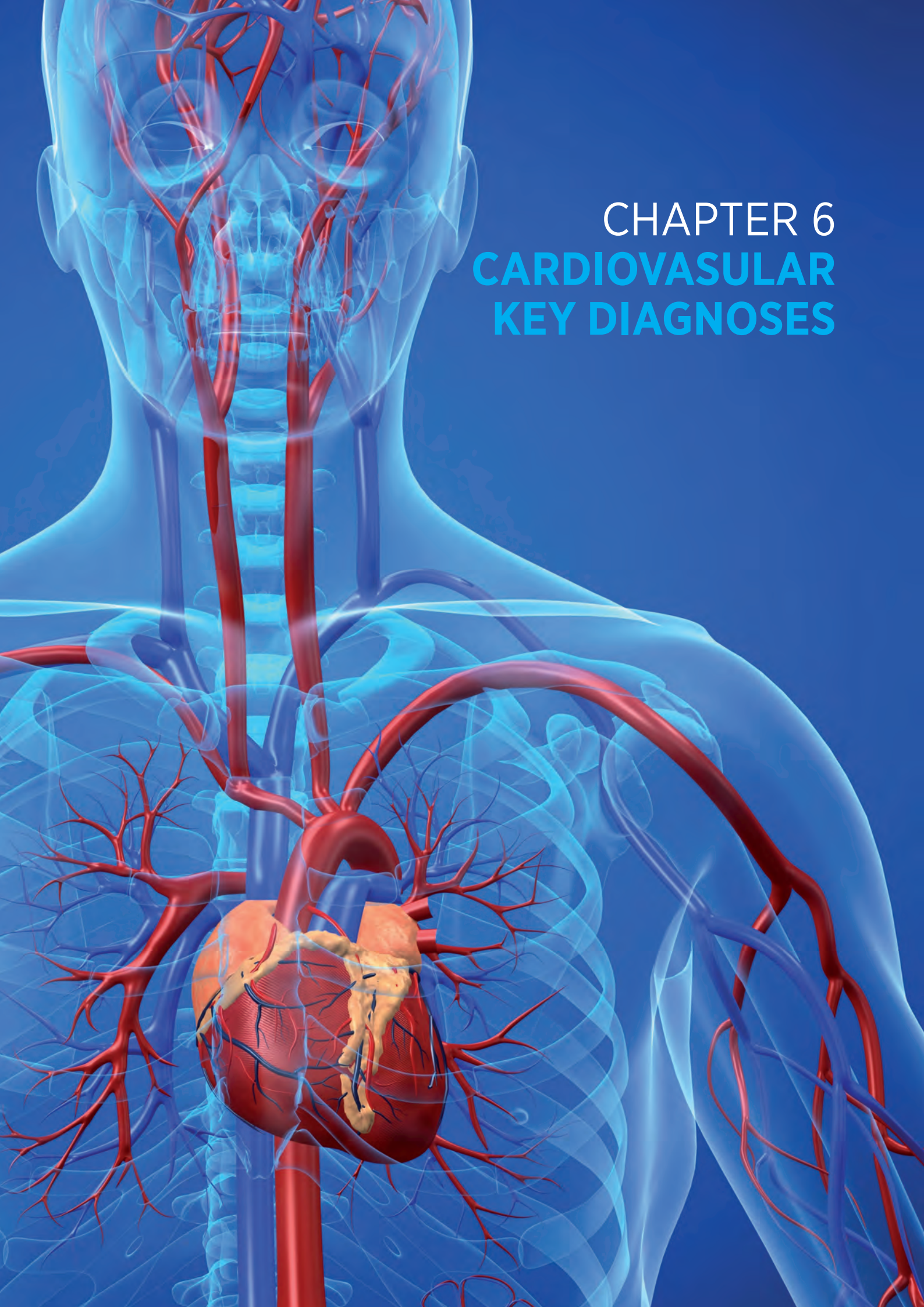
One potential limitation of this evaluation is the response rate of 58%. From 11 respondents, nine (82%) were from hospitals, representing a range of model 3 and 4 hospitals (Department of Health [DoH], 2013). While hospital groups and boards were not adequately represented in this sample, this sample represents 25% of all hospitals on the system. Accountability for care begins with the front line teams at a hospital level and it is at this level that NAHM is reported.

CONCLUSION

One of the main objectives is to collate information on the use of NAHM in 2016 and share learnings across the system. The findings of this report and the experience from hospitals is that NAHM outputs are being used to monitor mortality. While the use of NAHM may vary from site to site, this evaluation has yielded important information for knowledge sharing and for improvement. The latter actions include enhancements of the NQAIS NAHM tool and continued engagement with stakeholders.

Recommendation

NAHM should be used by clinicians, hospital managers and their boards as aquality improvement tool for the targeted review of hospital mortality patterns.



CHAPTER 6
CARDIOVASULAR KEY DIAGNOSES

CHAPTER 6

CARDIOVASCULAR DIAGNOSES

The NQAIS NAHM tool includes data for a range of cardiovascular diagnoses which are available for hospitals to review locally.

In this chapter, information is presented from NAHM for the following diagnoses:

- Acute myocardial infarction
- Heart failure
- Stroke – Ischaemic
- Stroke - Haemorrhagic

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 (HSE, RCPI, 2015). This is called an acute myocardial infarction (AMI). Such an interruption of blood flow to the heart muscle will weaken or permanently damage its ability to function. While there are important clinical differences between subtypes of myocardial infarction (ST elevation myocardial infarction (STEMI) and Non ST elevation myocardial infarction (NSTEMI)) (HSE, RCPI, 2015), for the purposes of this report these entities are grouped together.

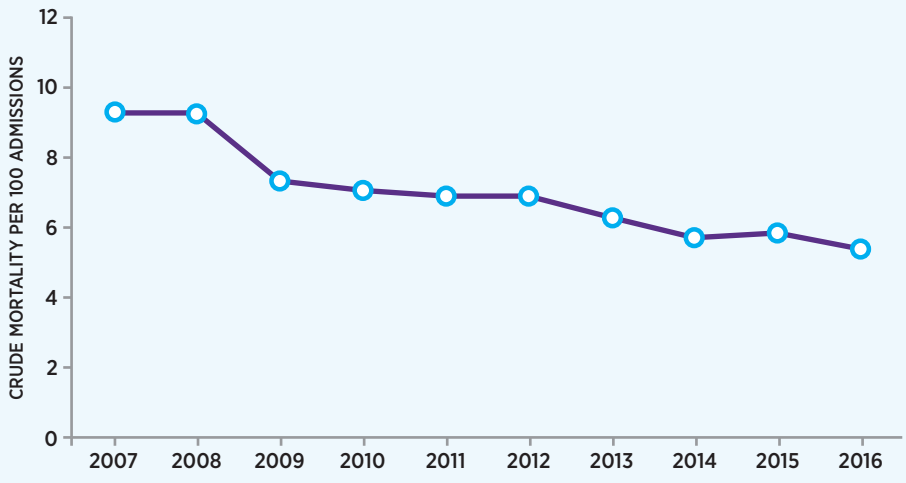
Care of patients having AMI is aimed at stabilising the blood flow to the heart muscle as soon as possible. Ultimately, where there are improvements in reperfusion of the heart muscle through interventions such as percutaneous coronary intervention (PCI) or thrombolysis along with early treatment with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

The measure presented here is the SMR for AMI and this is fully defined in Appendix 5.

Findings: In-hospital mortality following admission with a principal diagnosis of acute myocardial infarction

From HIPE data, a crude in-hospital mortality rate for AMI from 2007 to 2016 is presented in Figure 6. This data has not been adjusted for differences in age profile or comorbidities over time, but it provides background information to current hospital presentations. This illustrates a significant (40%) reduction during this time period (from 9.3 deaths per 100 admissions in 2007 to 5.6 deaths per 100 admissions in 2016).

FIGURE 6: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF AMI 2007 - 2016



- Twenty two hospitals had over 100 patients admitted with a principal diagnosis of AMI in 2016, ranging from 100 to 604 admissions. Figure 7 presents the SMR for these hospitals in a funnel plot. The control limits are set at 99.8%, meaning there is only a 1 in 500 chance of a hospital being outside these limits by chance alone. Control limits are calculated based on the number of admissions and the number of actual deaths in each hospital.
- The 22 hospitals included in this report represent 92% of all inpatients admitted with a diagnosis of AMI in 2016.
- Twenty one hospitals had an SMR within the control limits of 99.8% indicating that they were within the expected range. One hospital had an SMR outside that expected range.
- Twenty 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 (Table 2).

FIGURE 7: NATIONAL IN-HOSPITAL SMR FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF AMI, 2016

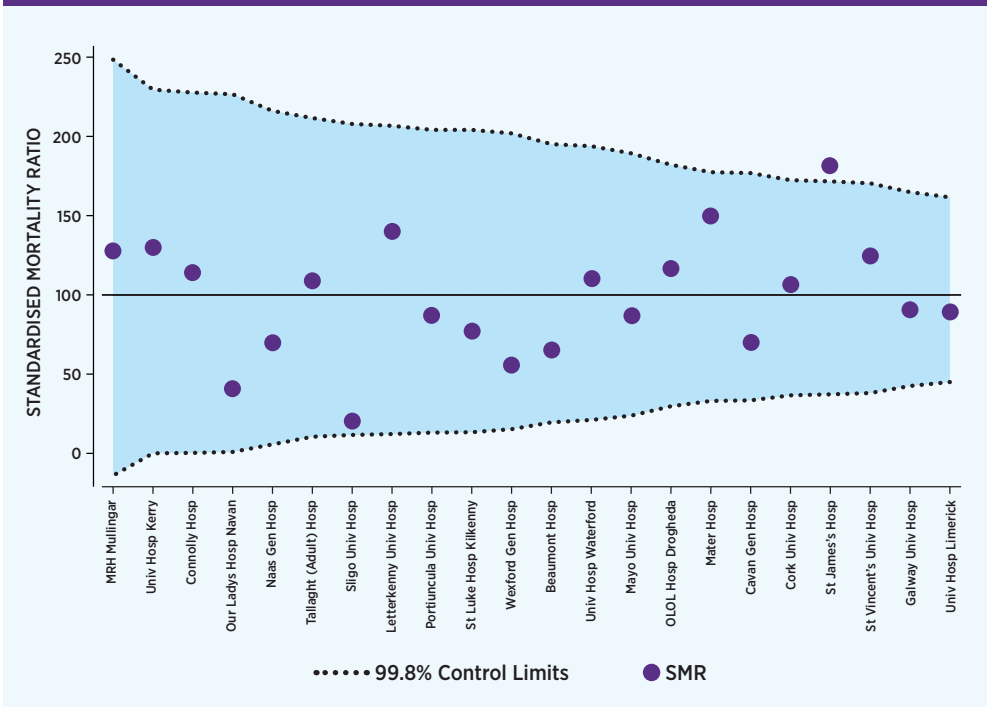


TABLE 5: TABULAR PRESENTATION FOR IN-HOSPITAL MORTALITY 2016 - AMI

Hospital Group	Hospital Name	No. of Admissions for AMI, 2016	SMR (99.8% Control Limits)
RCSI Hospital Group	Beaumont Hospital	214	65 (20 - 195)
	Cavan General Hospital	190	70 (33 - 177)
	Connolly Hospital	142	114 (0 - 228)
	Our Lady of Lourdes Hospital Drogheda	190	117 (30 - 182)
Ireland East Hospital Group	Mater Misericordiae University Hospital	450	150 (33 -177)
	Regional Hospital Mullingar	101	128 (-14 - 248)
	Our Lady's Hospital Navan	147	41 (1 - 227)
	St. Luke's Hospital, Kilkenny	223	77 (13 - 204)
	St. Vincent's University Hospital	259	125 (38 - 170)
	Wexford General Hospital	218	55 (15 - 202)
Dublin Midlands Hospital Group	Naas General Hospital	100	70 (6 - 216)
	St James's Hospital	523	181 (37 - 172)
	Tallaght (Adult) Hospital	207	109 (10 - 212)
UL Hospital Group	University Hospital Limerick	524	89 (45 - 162)
South / South West Hospital Group	Cork University Hospital	604	107 (37 - 172)
	University Hospital Kerry	121	130 (0 - 230)
	University Hospital Waterford	179	110 (21 - 194)
Saolta University Healthcare Group	Galway University Hospitals	530	91 (43 - 165)
	Letterkenny University Hospital	148	140 (12 - 207)
	Mayo University Hospital	249	87 (24 - 189)
	Portiuncula University Hospital	119	87 (13 - 204)
	Sligo University Hospital	145	21 (12 - 208)

HSE, National Clinical Programme for Acute Coronary Syndrome (ACS)

The National Clinical Programme for Acute Coronary Syndrome (ACS) was set up in Ireland in 2010 with the aim of saving lives by standardising the care of patients across the country. ACS covers ST Elevation MI (STEMI), Non ST Elevation MI (NSTEMI) and Unstable Angina (UA). The programme prioritised development of a national Optimal Reperfusion Service (ORS) protocol and treatment pathway for patients with a particular type of heart attack - STEMI. In 2010, a national data collection add-on to the HIPE portal, known as Heartbeat, was established to collect and report STEMI data in all centres that do PCI. The ORS was implemented nationally in January 2013 with seven Primary Percutaneous Coronary Intervention (PPCI) centre hospitals designated. This was rationalised in 2015 to the current six PPCI centres being Cork University Hospital, University Hospital Galway, University Hospital Limerick, Mater Misericordiae University Hospital, St James's Hospital and University Hospital Waterford. All centres operate 24/7 except University Hospital Waterford which operates as a 9am -5pm Monday to Friday centre.

The ORS protocol has been successful in that 92% of patients had this treatment (PPCI) in 2013-2014 (HSE, RCPI, 2015) in comparison to around 55% in 2011.

Discussion

NAHM presents SMR data for all hospitals where patients are admitted with all types of AMI. The SMR for AMI is presented across different types and models of hospitals (Model 2, 3 and 4). Some of these hospitals will provide more specialist treatment than others (HSE, 2010). Any interpretation of these findings should consider this.

Data from NQAIS NAHM should be used in conjunction with hospital data or other national data collections such as Heartbeat for AMI.

St James's hospital had an SMR above the upper control limit of 99.8% for 2016, meaning that their SMR was higher than could be explained by chance alone. An internal review was carried out by the hospital and a summary of the findings and commentary, endorsed by the hospital Chief Executive Officer is included.

ST JAMES'S HOSPITAL

St James's Hospital is committed to the National Audit of Hospital Mortality and the work of NOCA as a means of assuring and improving the quality of patient care. It is important that patients and their families can have confidence in the safety and quality of all services provided by the Hospital. The Hospital has reviewed the findings of the analysis of its data relating to Acute Myocardial Infarction and is absolutely confident that the analysis presented reflects data quality issues rather than any problems with the standard of clinical care provided. The Hospital's internal review of AMI data found that crude mortality rates for the last two quarters of 2016 were in fact 36% lower than those reflected by the NAHM analysis because not all AMI data had been included in the first analysis.

The Hospital regrets that the data submitted to HIPE was inaccurate but is deeply concerned that the HPO and NOCA timelines could not allow revision of the analysis prior to publication of the report this year. The Hospital anticipates that learning from its recent experience will prompt revised coding guidance from the Healthcare Pricing Office and improved processes to enable more timely data review and more effective collaboration between the NAHM audit team and the hospitals with which they engage.

St James's Hospital is assured also by the rigorous clinical governance systems in place in our Hospital to assure the safety and quality of care provided by its Cardiology service that patients with AMI received safe and effective care in 2016.

Mr Lorcan Birthistle
Chief Executive Officer
St James's Hospital

Responses to St James's Hospital review

NOCA

NOCA actively encourages hospitals to monitor their trends throughout the year and review their data, specifically where there are upward trends. However the concern of St James's Hospital that analysis and validation of their revised data was not possible once the HIPE file was closed is acknowledged. NOCA, working with stakeholders and international experts, under the direction of the NAHM Governance Committee, will consider options on the development of a process of data validation when the HIPE file is closed.

HPO

Where a patient has an AMI and is found to have Coronary Artery Disease (CAD) it may not always be clear, with regard to clinical coding sequencing, as to which condition rightly should be coded in HIPE as the principal diagnosis, particularly where the patient is being admitted for an intervention e.g. stenting. The Australian Coding Standards (ACS) published by the NCCH in The University of Sydney which provides guidance on the use and sequencing of the ICD-10-AM clinical coding classification used in Ireland, does not provide clear guidelines on this issue and have stated 'Improvements to the ACS in relation to the sequencing of AMI and CAD will be considered for a future edition'.

The HPO have contacted the NCCH requesting an update and clarification of the issue. In light of the issues outlined above, caution must be exercised when reviewing cases with a principal diagnosis of Myocardial Infarction or Coronary Artery Disease. Sequencing may be affected by the chart documentation, discharge summary 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 principal diagnosis. For further background information see Appendix 4.

HSE CLINICAL PROGRAMME

HSE, National Clinical Programme for ACS welcomes this work being carried out by the HPO on AMI sequencing guidelines to achieve more clarity and consistency.

Recommendation

- There should be exploration into a process of validation of data once the HIPE file is closed involving international experts, under the direction of the NAHM Governance Committee
- Hospitals should always triangulate NAHM to other data within their hospital and other national data collections e.g. Heartbeat. This can include a broader context of quality tools, such as patient experience and complaints, staff feedback and safety incident reporting.
- Increased collaboration between Cardiologists / treating clinicians and clinical coders (or where available coders assigned to a speciality) will improve the quality of medical records and coding of hospital cardiology data in HIPE.

HEART FAILURE

Introduction

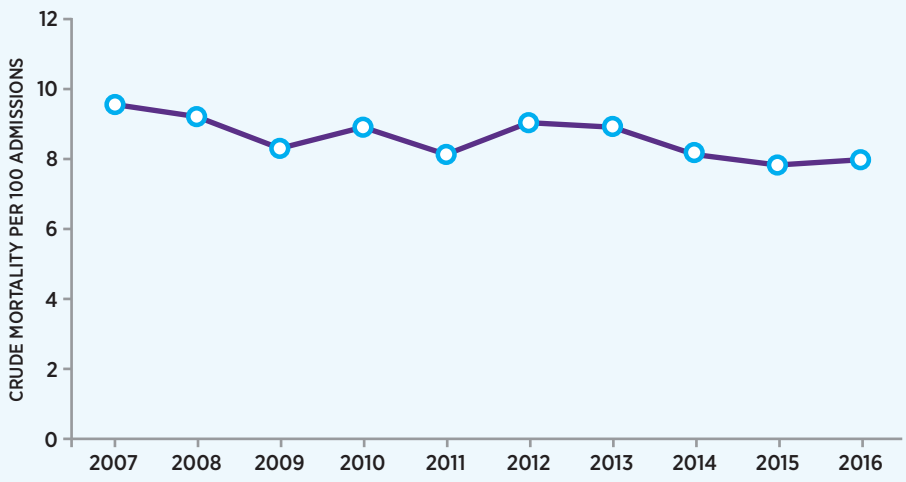
Heart failure is an abnormality of cardiac function and structure. It is caused by a progressive weakening of the heart muscle, resulting in its inability to pump adequate amounts of blood needed to perfuse organs and other tissues. Heart failure can be classified as an acute or chronic disease process, with worsening disease resulting in admission to hospital.

There are several classifications within heart failure such as acute or chronic. The measure presented here is the SMR for heart failure and this is fully defined in Appendix 6.

Findings: In-hospital mortality following admission with a principal diagnosis of heart failure

From HIPE data, a crude in-hospital mortality rate for heart failure from 2007 to 2016 is presented in Figure 8. This data has not been adjusted for differences in age profile or comorbidities over time, but it provides background information to current hospital presentations. This shows a small but significant (16%) reduction in in-hospital mortality over that time period (from 9.5 deaths per 100 admissions in 2007 to 8 deaths per 100 admissions in 2016).

FIGURE 8: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF HEART FAILURE 2007 - 2016



- Twenty eight hospitals had over 100 patients with a principal diagnosis of heart failure on admission to hospital in 2016. The number of admissions in these hospitals ranged from 102 to 365. Figure 9 presents the SMR for these hospitals in a funnel plot, with 99.8% control limits.
- The 28 hospitals included in this report represent 93% of all in-patients admitted with a diagnosis of heart failure in 2016.
- All hospitals had an SMR within the control limits, indicating that all hospitals SMRs were within the expected range.
- Sixteen hospitals are not included in this analysis, as they did not meet the selection criterion relating to defined number of admissions and expected events (Table 2).

FIGURE 9: NATIONAL IN-HOSPITAL SMR FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF HEART FAILURE IN 2016

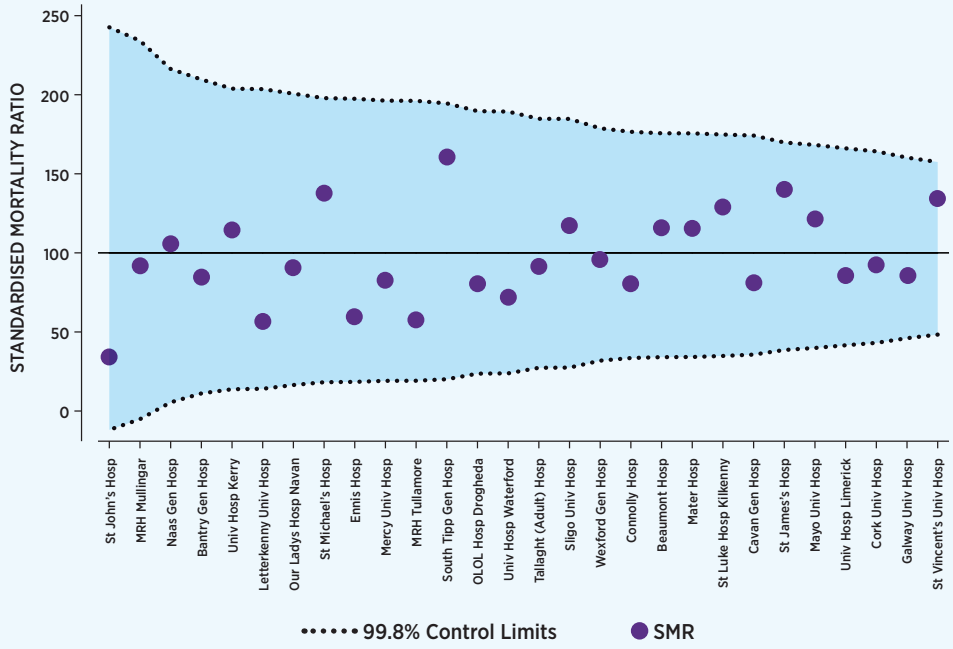


TABLE 6: TABULAR PRESENTATION FOR IN-HOSPITAL MORTALITY 2016 - HEART FAILURE

Hospital Group	Hospital Name	No. of Admissions for Heart Failure, 2016	SMR (99.8% Control Limits)
RCSI Hospital Group	Beaumont Hospital	258	116 (34 - 176)
	Cavan General Hospital	227	82 (36 - 174)
	Connolly Hospital	184	81 (34 - 177)
	Our Lady of Lourdes Hospital Drogheda	210	80 (24 - 190)
Ireland East Hospital Group	Mater Misericordiae University Hospital	268	116 (34 - 176)
	Regional Hospital Mullingar	108	92 (-5 - 234)
	Our Lady's Hospital Navan	145	91 (16 - 201)
	St. Luke's Hospital, Kilkenny	246	129 (35 - 175)
	St. Vincent's University Hospital	288	134 (48 - 157)
	Wexford General Hospital	228	97 (32 - 179)
Dublin Midlands Hospital Group	Midland Regional Hospital Tullamore	148	58 (19 - 196)
	Naas General Hospital	116	106 (5 - 216)
	St James's Hospital	313	140 (39 - 170)
	Tallaght (Adult) Hospital	163	92 (27 - 185)
UL Hospital Group	Ennis Hospital	108	60 (18 - 197)
	St John's Hospital	102	35 (-12 - 243)
	University Hospital Limerick	316	86 (42 - 166)
South / South West Hospital Group	Bantry General Hospital	112	85 (11 - 210)
	Cork University Hospital	365	93 (43 - 164)
	Mercy University Hospital	181	83 (19 - 196)
	South Tipperary General Hospital	138	161 (20 - 195)
	University Hospital Kerry	157	114 (14 - 204)
	University Hospital Waterford	223	72 (24 - 189)
Saolta University Healthcare Group	Galway University Hospitals	319	86 (46 - 160)
	Letterkenny University Hospital	182	57 (14 - 204)
	Mayo University Hospital	286	122 (40 - 168)
	Sligo University Hospital	162	118 (27 - 185)

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 setting.

Heart Failure is a major public health problem affecting more than 120,000 Irish people. Twenty percent (one in five) people can expect to develop heart failure in their lifetime (Lloyd-Jones D et al., 2002).

Discussion

Patients with heart failure were admitted to 28 (64%) participating hospitals in 2016. The crude in-hospital mortality rate was estimated at 8% in 2016. All 28 hospitals included in the analysis were within the expected range. This report only reflects on in-hospital mortality and not on overall heart failure mortality in Ireland.

Recommendation

- Hospitals should always triangulate NAHM to other sources of heart failure data within their hospital. This can include a broader context of quality tools, such as patient experience and complaints, staff feedback and safety incident reporting.
- Increased collaboration between Cardiologists / treating clinicians and clinical coders (or where available coders assigned to a speciality) will improve the quality of medical records and coding of hospital cardiology data in HIPE.

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 blockage or rupture of a blood vessel. Like all organs, the brain needs oxygen and nutrients provided by blood to function properly. If the supply of blood becomes interrupted or cut off, brain cells begin to die. When the affected brain cells die, the part of the body controlled by these cells stops working. Depending on the location and size of the affected area, a stroke can lead to brain injury, disability and possibly even death. Stroke affects 17 million people worldwide each year. It is the third most common cause of death in Ireland and a leading cause of adult disability (RCP, 2016).

There are two main types of stroke.

- **ischaemic** – where the blood supply to the brain is stopped due to a blood clot, accounting for approximately 85% of all strokes.
- **Haemorrhagic** – where a weakened blood vessel supplying the brain ruptures, causing bleeding into or around the brain. These account for the remaining number of strokes. (Kings College London, 2017)

HSE, National Clinical Programme for Stroke

Stroke (both ischaemic and haemorrhagic) is recognised as a leading cause of mortality and disability. The HSE, National Stroke Programme, since its implementation in 2010, prioritised improving outcomes for stroke patients. Key objectives include prevention of stroke, access to quality stroke service and reduction of death and disability. Twenty two Irish hospitals now have stroke units. The recent Irish Heart Foundation, HSE National Stroke Audit, Rehabilitation Units report showed that the incidence of stroke is rising by 4% to 5% annually (McElwaine et al., 2016).

CHAPTER 6

ISCHAEMIC STROKE

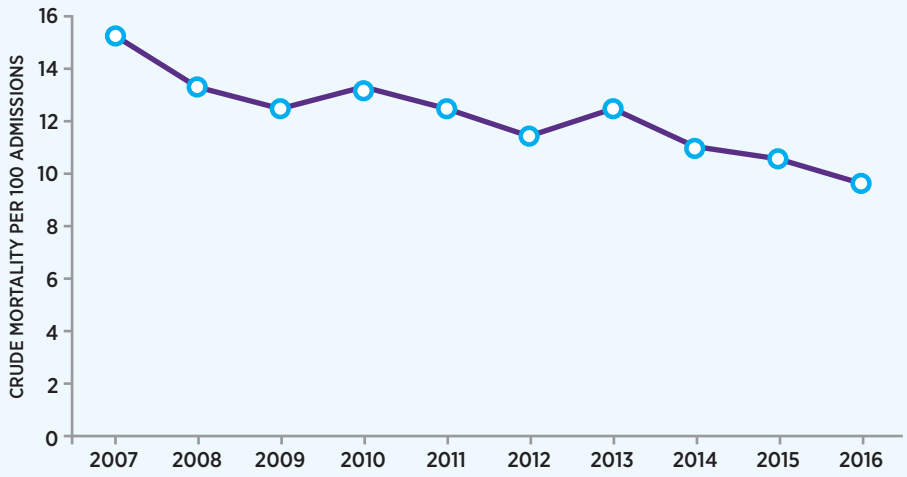
Introduction

Ischaemic stroke is the most common form of stroke whereby blood flow to the brain is interrupted either by 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 circulation (usually from the heart but also from the diseased wall of the aortic arch or carotid artery) to cause blockage in a vessel in the brain (cerebral embolism). There are several classifications within ischaemic stroke. The measure presented here is the SMR for ischaemic stroke and this is fully defined in Appendix 7.

Findings: In-hospital mortality following admission with a principal diagnosis of ischaemic stroke

From HIPE data, a crude in-hospital mortality rate for Ischaemic Stroke between 2007 - 2016 is presented in Figure 10. This data has not been adjusted for differences in age profile or comorbidities over time, but it provides background information to current hospital presentations. This shows a significant reduction (36%) in in-hospital mortality over that time period (from 15.2 deaths per 100 admissions in 2007 to 9.8 deaths per 100 admissions in 2016).

FIGURE 10: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF ISCHAEMIC STROKE, 2007 - 2016



- Twenty hospitals had over 100 patients with a principal diagnosis of ischaemic stroke on admission to hospital during 2016. The number of admissions ranged from 106 to 460 in that year. Figure 11 presents the SMR for these hospitals in a funnel plot, with control limits at 99.8%.
- The 20 hospitals included in this report represent 88% of all inpatients admitted with a diagnosis of ischaemic stroke in 2016.
- Nineteen hospitals had an SMR within the control limits of 99.8% indicating that they were within the expected range. One hospital had an SMR outside that expected range.
- Twenty four hospitals are not included in this analysis, as they did not meet the selection criterion relating to defined number of admissions and expected events (Table 2).

FIGURE 11: NATIONAL IN-HOSPITAL SMR FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF ISCHAEMIC STROKE IN 2016

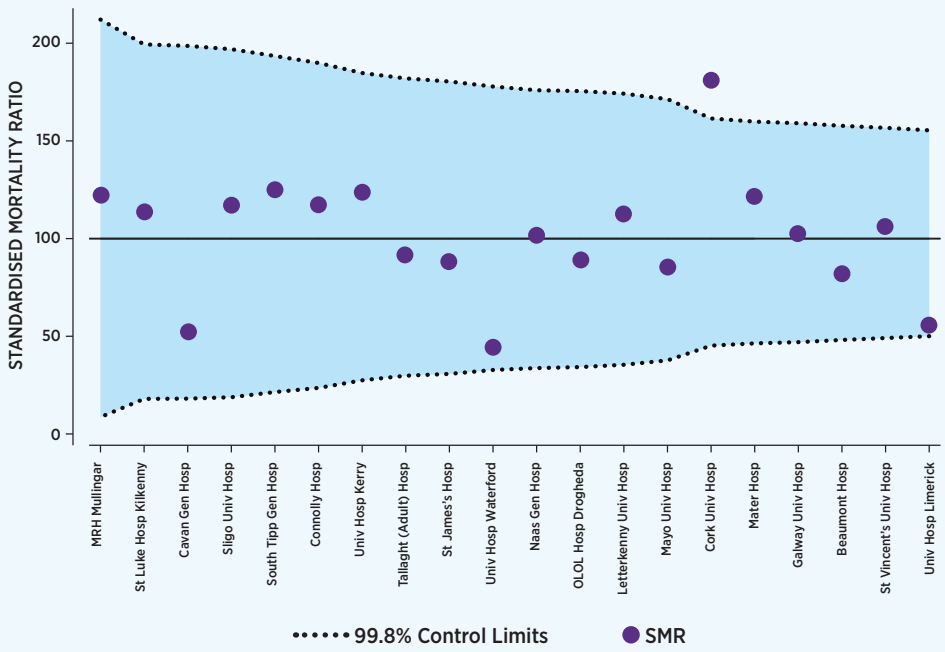


TABLE 7: ISCHAEMIC STROKE: TABULAR PRESENTATION FOR IN-HOSPITAL MORTALITY 2016

Hospital Group	Hospital Name	No. of Admissions for Ischaemic Stroke, 2016	SMR (99.8% Control Limits)
RCSI Hospital Group	Beaumont Hospital	460	82 (48-158)
	Cavan General Hospital	117	52 (18-199)
	Connolly Hospital	150	117 (24-190)
	Our Lady of Lourdes Hospital Drogheda	159	89 (34-176)
Ireland East Hospital Group	Mater Misericordiae University Hospital	308	122 (46-160)
	Regional Hospital Mullingar	108	122 (9-212)
	St. Luke's Hospital, Kilkenny	124	114 (18-199)
	St. Vincent's University Hospital	305	107 (49-157)
Dublin Midlands Hospital Group	Naas General Hospital	171	101 (34-176)
	St James's Hospital	234	89 (31-180)
	Tallaght (Adult) Hospital	192	92 (30-182)
UL Hospital Group	University Hospital Limerick	335	56 (50-155)
South / South West Hospital Group	Cork University Hospital	399	181 (45-161)
	South Tipperary General Hospital	106	125 (21-193)
	University Hospital Kerry	151	124 (27-185)
	University Hospital Waterford	129	45 (33-178)
Saolta University Healthcare Group	Galway University Hospitals	236	103 (47-159)
	Letterkenny University Hospital	167	113 (35-174)
	Mayo University Hospital	167	85 (38-171)
	Sligo University Hospital	140	117 (19-197)

Discussion

Cork University Hospital had an SMR outside the upper control limit in 2016, meaning that this SMR was higher than could be explained by chance alone. This hospital carried out a review of both the coding and the clinical care for that period. A summary of the findings of that review, endorsed by the Chief Executive Officer are included below.

CORK UNIVERSITY HOSPITAL

Introduction

A 'red' signal relating to Ischaemic Stroke was identified for 2016. Analysis identified the months of February and August as having significant deviation from expected mortality. We chose to look at the clinical data for those months and identify potential causal factors, having planned a 'Structured Judgment' approach (currently being advocated by the Royal College of Physicians UK) if quality of care were deemed one of the contributing factors to the outcomes documented.

Findings and Discussion

There were no quality of care deficits identified in this review. The overwhelming finding was that both severity of stroke and presence of severe co-existing disease were significant factors contributing to our higher mortality. All patients were included in the hospital's stroke integrated care pathway.

To supplement our audit findings we refer to the performance of CUH within the framework of the National Stroke Programme Audit. CUH has above average performance on the other national stroke key performance indicators (KPI) of thrombolysis rate (17%) and the portion of patients admitted to the stroke unit. We also considered hospital data on ischaemic stroke patients. We identified some issues around HIPE coding particularly in relation to the coding of a number of patients admitted with transient ischaemic attack. To address this in the future, there will be close interaction regarding this diagnosis between clinicians and coders. As a general measure, we are also adopting an electronic discharge letter template which will be 'HIPE' friendly and reduce potential inaccuracies in the data.

Finally, we considered had the casemix of ischaemic stroke changed over a period of time? We found there has been significant reconfiguration in the region with fewer strokes managed in smaller units and a greater number managed in CUH. This fact coupled with the presence of a 'Thrombectomy' service in CUH means we receive and care for an increasing volume and severity of illness in this patient population.

We have recommended that NOCA NAHM consider inclusion of a stroke severity scale which could potentially reduce the disparity between expected and actual outcome.

There was a great deal of mutual learning derived from the interaction prior to and during our meeting with NOCA which is set to continue into the future.

Mr Tony McNamara
Chief Executive Officer
Cork University Hospital

Dr Declan O'Brien
Consultant Anaesthetist
Clinical lead for Quality & Safety
Cork University Hospital

Responses to Cork University Hospital review

NOCA

Currently there is no measure for illness severity within the NQAIS NAHM tool. The HSE National Stroke Register have introduced the National Institute of Health Stroke Scale (NIHSS) in late 2017 to objectively assess the severity of the stroke. The possibility of an illness severity score within the NQAIS NAHM tool should be examined by the NAHM Governance Committee.

HSE Clinical Programme

The HSE National Clinical Programme for Stroke is introducing the NIHSS as the standard clinical assessment of stroke severity and is routinely used when patients are considered acutely for thrombolysis or thrombectomy, though not always in other cases. It is part of the national programme for stroke to ensure that all staff assessing stroke patients are trained in the NIHSS and will be a key recommendation that all stroke patients have this performed at least on admission and discharge (and in between at the recommended time intervals post thrombolysis and post thrombectomy). The widespread utilisation of a standardised stroke severity scale and capture of such data is critical to assessing acute treatment outcomes and analysing performance across different sites with likely different case-mix. The Programme welcomes the triangulation of hospital data with the National Stroke Register.

HAEMORRHAGIC STROKE

Introduction

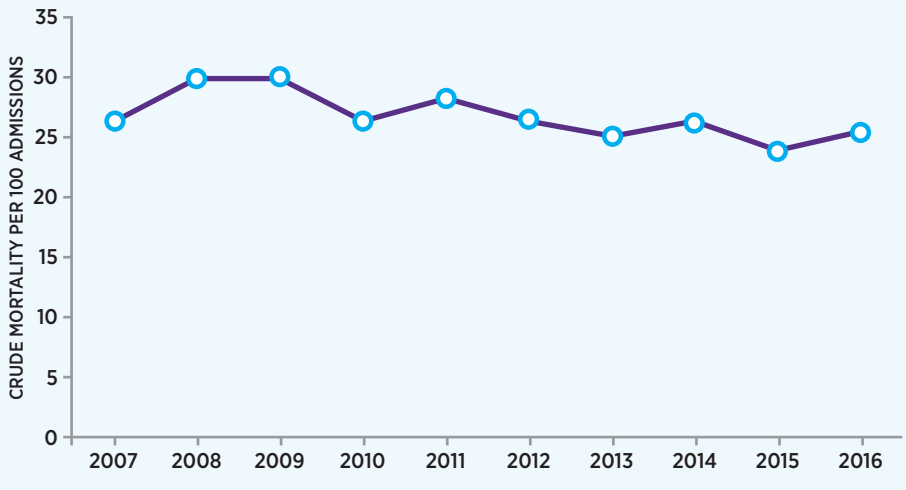
Intracerebral and sub-arachnoid haemorrhages, caused by ruptured blood vessels leading to bleeding in the brain, cause stroke (Irish Heart Foundation). Brain haemorrhages should only be classified as stroke if they are non-traumatic, caused by a vascular event and result in injury or ischemia to the central nervous system / brain (Sacco et al., 2013). Haemorrhagic stroke occurs less frequently than ischaemic stroke, but can have much higher associated mortality and morbidity (Sacco et al., 2013).

The measure presented here is the SMR for patients who were admitted to hospital with haemorrhagic stroke and this is fully defined in Appendix 8. Due to the low numbers of patients with a principal admission diagnosis of haemorrhagic stroke, a three year period 2014-2016 was selected.

Findings: In-hospital mortality following admission with a principal diagnosis of haemorrhagic stroke

From HIPE data, a crude in-hospital mortality rate for haemorrhagic stroke from 2007 to 2016 is presented in Figure 12. This data has not been adjusted for differences in age profile or comorbidities over time, but it provides background information to current hospital presentations. This shows that the rate of in-hospital mortality did not show a significant reduction over that time period reflecting perhaps the lack of any new evidence based treatment for intracerebral haemorrhage.

FIGURE 12: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF HAEMORRHAGIC STROKE, 2007 - 2016



- Eleven hospitals had over 100 patients with a principal diagnosis of haemorrhagic stroke following admission between 2014 and 2016. Over this time period, the number of admissions ranged from 100 to 891. Figure 13 presents the SMR for these hospitals in a funnel plot, with control limits of 99.8%.
- The 11 hospitals included in this report represent 70% of all inpatients admitted with a diagnosis of haemorrhagic stroke in 2014 - 2016.
- All hospitals had an SMR within the control limits, indicating that all hospitals SMRs were within the expected range.
- Thirty three hospitals are not included in this analysis, as they did not meet the selection criterion relating to defined number of admissions and expected events (Table 2).

FIGURE 13: NATIONAL IN-HOSPITAL SMR FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF HAEMORRHAGIC STROKE IN 2014 - 2016

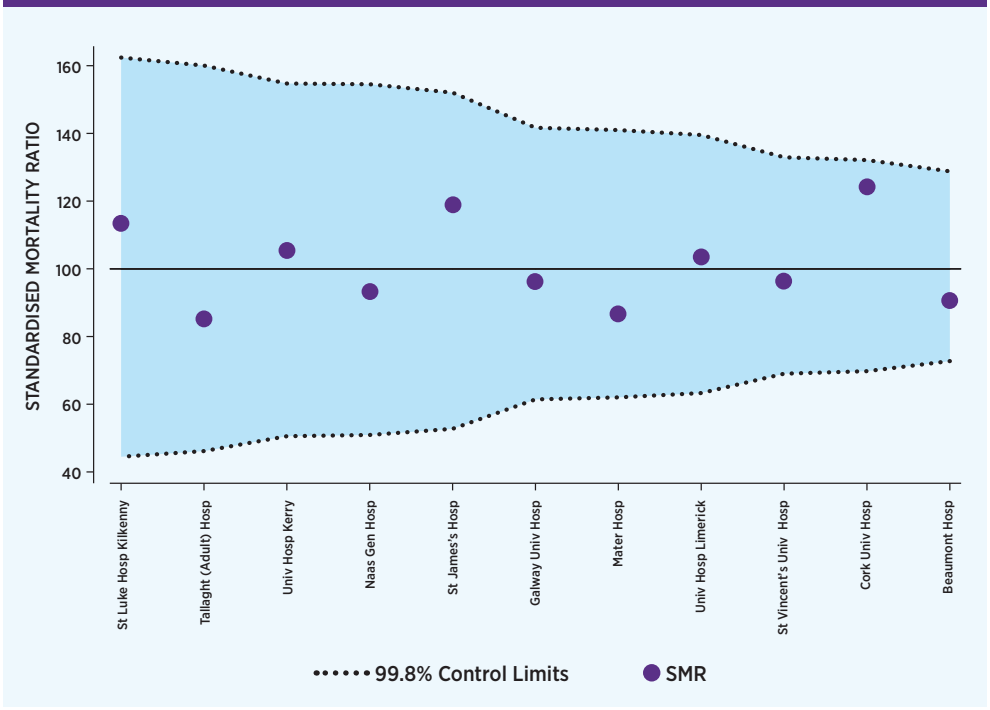


TABLE 8: TABULAR PRESENTATION FOR IN-HOSPITAL MORTALITY 2014 – 2016 HAEMORRHAGIC STROKE

Hospital Group	Hospital Name	No. of Admissions for Haemorrhagic Stroke, 2014-16	SMR (99.8% Control Limits)
RCSI Hospital Group	Beaumont Hospital	891	91 (73-129)
Ireland East Hospital Group	Mater Misericordiae University Hospital	207	87 (62-141)
	St. Luke's Hospital, Kilkenny	100	113 (44-162)
	St. Vincent's University Hospital	288	96 (69-133)
Dublin Midlands Hospital Group	Naas General Hospital	105	93 (51-155)
	St James's Hospital	152	119 (53-152)
	Tallaght (Adult) Hospital	121	85 (46-160)
UL Hospital Group	University Hospital Limerick	239	104 (63-140)
South / South West Hospital Group	Cork University Hospital	452	124 (70-132)
	University Hospital Kerry	110	106 (51-155)
Saolta University Healthcare Group	Galway University Hospitals	174	96 (61-142)

Discussion

Subdural and epidural haematomas are not included in the definition of stroke (Sacco et al., 2013). Following engagement with the HSE National Clinical Programme for Stroke in 2016, and through the NOCA NAHM Governance Committee, concern was raised about the inclusion of subdural and epidural haematoma (ICD-10-AM I62) within the Haemorrhagic Stroke Clinical Classification Software (CCS) Group for the NAHM report. Subdural and epidural haematomas are not included in the data collection for the HSE, National Stroke Register as neither are recognised as stroke internationally.

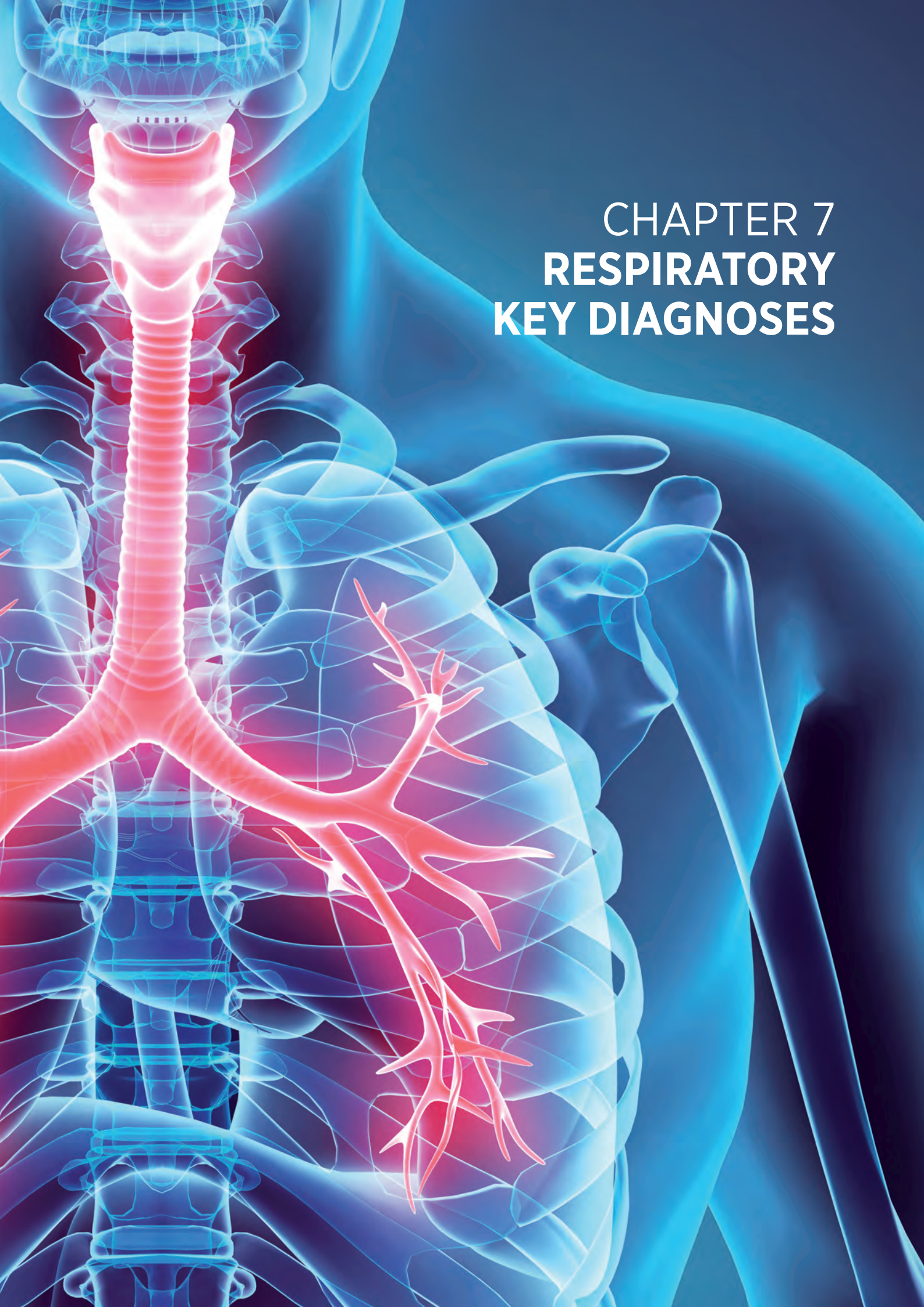
Findings

The NAHM Governance Committee considered this international evidence and decided to remove both conditions from the haemorrhagic stroke CCS group. Both subdural and epidural haematoma are now a distinct CCS Group within NQAIS NAHM. The impact of this change is that the number of patients within the haemorrhagic stroke CCS Group have reduced and consequently there are fewer hospitals who have met the criteria for inclusion under the diagnosis in this report. NOCA will monitor both of these CCS Groups going forward.

NOCA and the NAHM Governance Committee are supporting a submission by the HSE National Clinical Programme for Stroke to the Organisation for Economic Cooperation and Development (OECD) to change the coding of stroke internationally. This will enable benchmarking with OECD reports.

Recommendation

- The possibility of an illness severity score within the NQAIS NAHM tool should be explored by the NAHM Governance Committee.
- Hospitals should always triangulate NAHM to other data within their hospital and other national data collections e.g. National Stroke Register. This can include a broader context of quality tools, such as patient experience and complaints, staff feedback and safety incident reporting.
- Increased collaboration between stroke or other treating clinicians and clinical coders (or where available coders assigned to a speciality) will improve the quality of medical records and coding of hospital stroke data in HIPE.



CHAPTER 7
RESPIRATORY KEY DIAGNOSES

CHAPTER 7

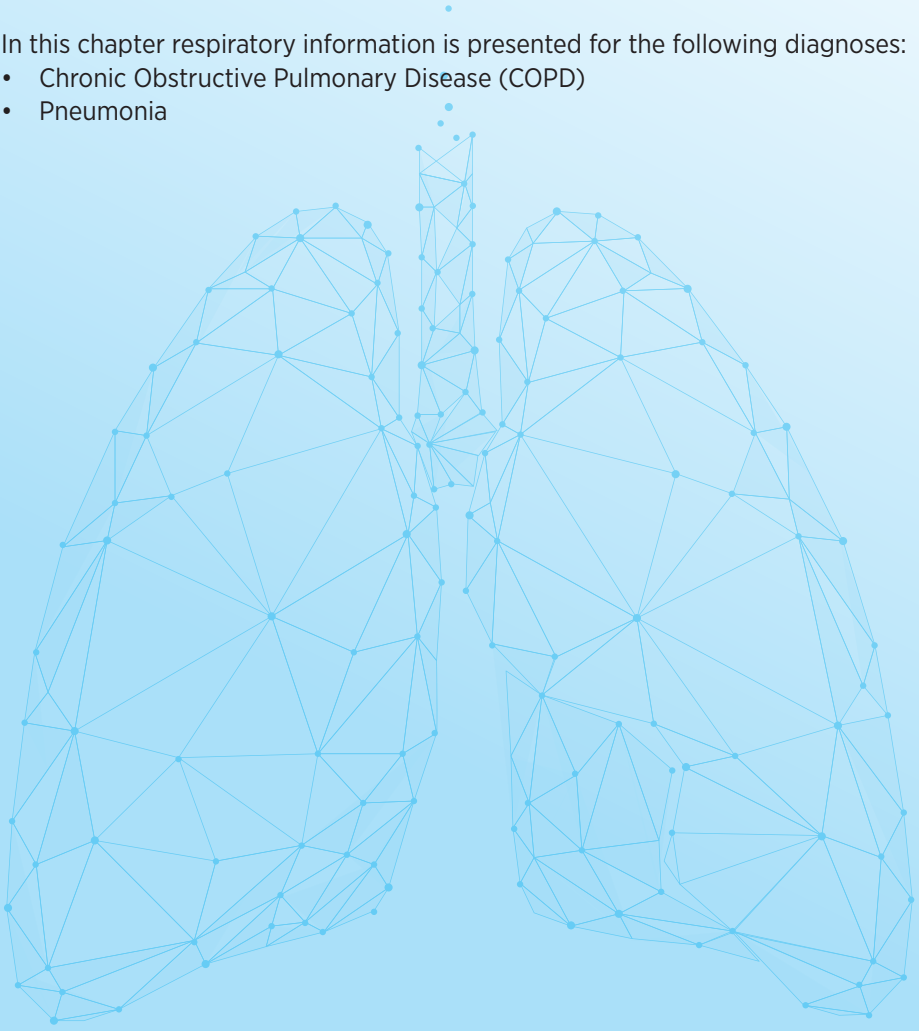
RESPIRATORY DIAGNOSES

The NQAIS NAHM tool includes data for a range of respiratory diagnoses which are available for hospitals to review locally. A recommendation was made to report on a broader cohort of respiratory diseases such as pneumonia, COPD and acute bronchitis within one CCS Group (NOCA, 2016). This would give a wider view in a speciality where the reason for admission to the acute hospital can be difficult to pinpoint as these older patients often have multiple comorbid diseases, (Global Initiative for Chronic Obstructive Lung Disease (GOLD), 2016). Analysis revealed that there is some evidence of a variation in mortality between patients with and without COPD, however the difference is not statistically significant. Inconsistency in coding nationally is significant (personal communication, M. Keane, Open App, 08.03.2017). No change was made to these CCS Groupings to address the inconsistency of coding, the HSE National Clinical Programme for COPD liaised with the HPO and have provided support for their educational and training programme. Pneumonia is now included in this report.

Consideration was given to including acute bronchitis within this report. A detailed review of cases within the acute bronchitis CCS grouping showed that an overwhelming majority of all hospital admissions in this group had a principal diagnosis code of unspecified acute lower respiratory infection (ICD-10-AM J22) which would not be considered acute bronchitis. As the current acute bronchitis CCS group is not reflective of the disease, it is not included in this report. Further analysis of this CCS group is required.

In this chapter respiratory information is presented for the following diagnoses:

- Chronic Obstructive Pulmonary Disease (COPD)
- Pneumonia



CHRONIC OBSTRUCTIVE PULMONARY DISEASE

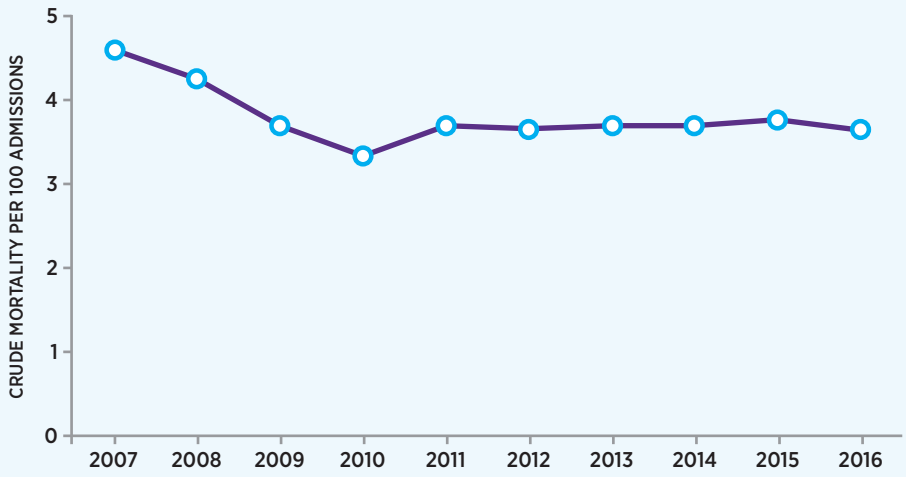
Introduction

COPD is a common progressive lung disease and is the most prevalent respiratory disease in adults. It is characterised by a persistent and progressive airflow limitation, associated with an enhanced chronic inflammatory response in the airways and the lung. It is complicated by exacerbations and individual comorbidities contributing to overall illness severity (GOLD, 2016). This progressive airflow limitation is caused by a mixture of small airways disease (obstructive bronchiolitis) and parenchymal destruction (emphysema), the relative contributions of which vary from person to person (GOLD, 2016). This definition has been adopted by the HSE National Clinical Programme for COPD (HSE, 2016). COPD has considerable impact both on the quality and quantity of life of the patient, involving long term medical care, frequent hospital admissions for many and often resulting in premature death. The measure presented here is the SMR for COPD and this is fully defined in Appendix 9.

Findings: In-hospital mortality following admission with a principal diagnosis of COPD

From HIPE data, a crude in-hospital mortality rate for COPD from 2007 to 2016 is presented in Figure 14. This data has not been adjusted for differences in age profile or comorbidities over time, but it provides background information to current hospital presentations. This shows that the rate of in-hospital mortality has had a small but significant (22%) reduction over that time period (from 4.6 deaths per 100 admissions in 2007 to 3.6 deaths per 100 admissions in 2016).

FIGURE 14: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF COPD, 2007-2016



- Thirty three hospitals had over 100 patients with a principal diagnosis of COPD following admission in 2016. The number of admissions ranged from 138 to 812. Figure 15 presents the SMR for these hospitals in a funnel plot, with 99.8% control limits.
- The 33 hospitals included in this report represent 100% of all inpatients admitted with a diagnosis of COPD in 2016.
- All hospitals had an SMR within the control limits of 99.8%, indicating that all hospitals SMR's were within the expected range.
- Eleven hospitals are not included in this analysis, as they did not meet the selection criterion relating to defined number of admissions and expected events (Table 2).

FIGURE 15: NATIONAL IN-HOSPITAL SMR FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF COPD IN 2016

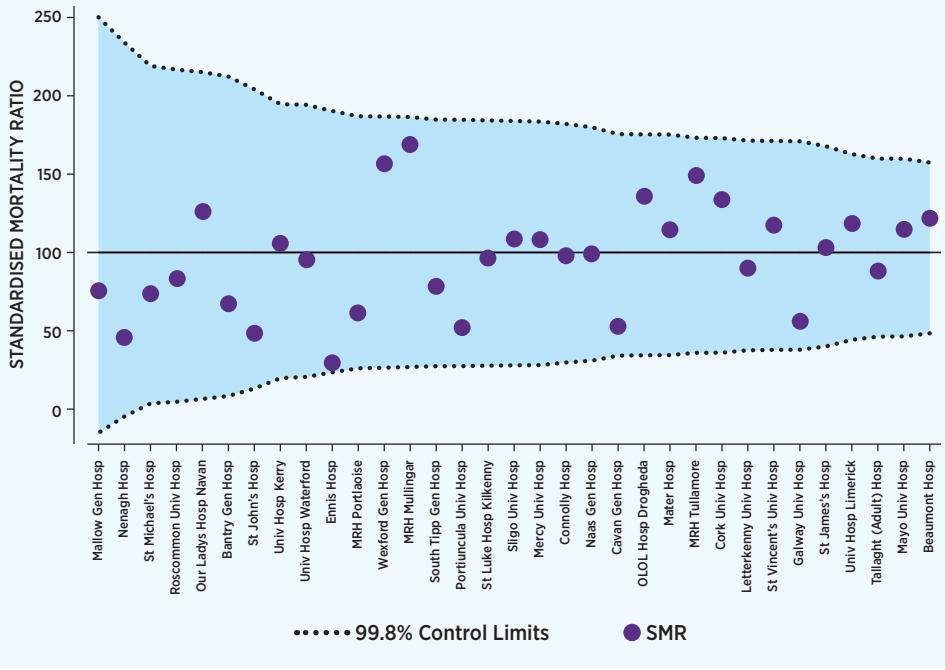


TABLE 9: TABULAR PRESENTATION FOR IN-HOSPITAL MORTALITY 2016 - COPD

Hospital Group	Hospital Name	No. of Admissions for COPD 2016	SMR (99.8% Control Limits)
RCSI Hospital Group	Beaumont Hospital	812	122 (48-157)
	Cavan General Hospital	500	53 (34-176)
	Connolly Hospital	467	98 (30-182)
	Our Lady of Lourdes Hospital Drogheda	615	136 (34-175)
Ireland East Hospital Group	Mater Misericordiae University Hospital	793	115 (34-175)
	Regional Hospital Mullingar	435	169 (27-187)
	Our Ladys Hospital Navan	256	127 (6-215)
	St Luke's Hospital Kilkenny	488	97 (28-184)
	St Michael's Hospital	161	74 (4-219)
	St Vincent's University Hospital	443	117 (38-171)
	Wexford General Hospital	624	157 (26-187)
Dublin Midlands Hospital Group	Midland Regional Hospital Tullamore	441	149 (36-173)
	Midland Regional Hospital Portlaoise	296	62 (26-187)
	Naas General Hospital	400	99 (31-180)
	St James's Hospital	679	103 (40-168)
	Tallaght (Adult) Hospital	771	88 (46-160)
UL Hospital Group	Ennis Hospital	273	29 (23-190)
	Nenagh Hospital	179	46 (-5-234)
	St John's Hospital	377	49 (13-204)
	University Hospital Limerick	689	119 (44-163)
South / South West Hospital Group	Bantry General Hospital	230	67 (8-212)
	Cork University Hospital	627	134 (36-173)
	Mallow General Hospital	204	76 (-15-250)
	Mercy University Hospital	557	108 (28-184)
	South Tipperary General Hospital	467	79 (27-185)
	University Hospital Kerry	352	106 (20-195)
	University Hospital Waterford	400	96 (21-194)
Saolta University Healthcare Group	Galway University Hospitals	575	56 (38-171)
	Letterkenny University Hospital	744	90 (38-171)
	Mayo University Hospital	610	115 (46-160)
	Portiuncula University Hospital	324	52 (27-185)
	Roscommon University Hospital	138	84 (5-217)
	Sligo University Hospital	421	109 (28-184)

HSE, National Clinical Programme for COPD

The HSE National Clinical Programme for COPD aims to reduce the number of COPD deaths and in-hospital admissions through correct diagnosis and correct treatment. It is estimated that almost 500,000 people aged 40 years and over in Ireland have COPD, of whom over 200,000 have moderate or severe disease (DOH, 2017).

There has been a decrease in hospitalisation for COPD in Ireland from 409 per 100,000 population in 2007 to 389 in 2016, however Ireland continue to have the highest rate of hospitalisations for COPD in the OECD (DOH, 2017). Mortality figures from the Central Statistics Office (CSO) show that 1,358 patients died from COPD in 2015 (CSO, 2017).

Discussion

No hospitals were outside the control limits for COPD in 2016. Last year one hospital had an SMR above the upper control limit. The hospital have worked with NOCA over the past year looking at their mortality figures and have provided an update on their review (See Chapter 4: Hospital Engagement with NAHM).

It is clear that COPD frequently occurs in combination with one or more comorbid respiratory conditions. Exacerbations of COPD can be caused by other factors including bacterial and/or viral infection (HSE National Clinical Programme for COPD, 2016).

Comorbidities, especially where respiratory disease is comorbid, can have a major impact on both quality of life and survival. It should be noted that where there is variation in documentation and /or coding between COPD and other respiratory diseases, this may impact on reported mortality. As noted in regard to the acute bronchitis CCS Group, a large number of patients have been assigned a principal diagnosis of acute lower respiratory infection. Some of these patients may in fact have a principal diagnosis of COPD. Continued education on documentation within hospitals and a focus on coding within the respiratory speciality has been identified as a requirement.

Recommendation

- Hospitals should always triangulate NAHM to other data within their hospital and other available sources i.e. length of stay (LOS) and readmission KPI's from the HSE National Clinical Programme for COPD. This can include a broader context of quality tools, such as patient experience and complaints, staff feedback and safety incident reporting.
- Increased collaboration between respiratory or other treating clinicians and clinical coders (or where available coders assigned to a speciality) will improve the quality of medical records and coding of hospital respiratory data in HIPE.

PNEUMONIA

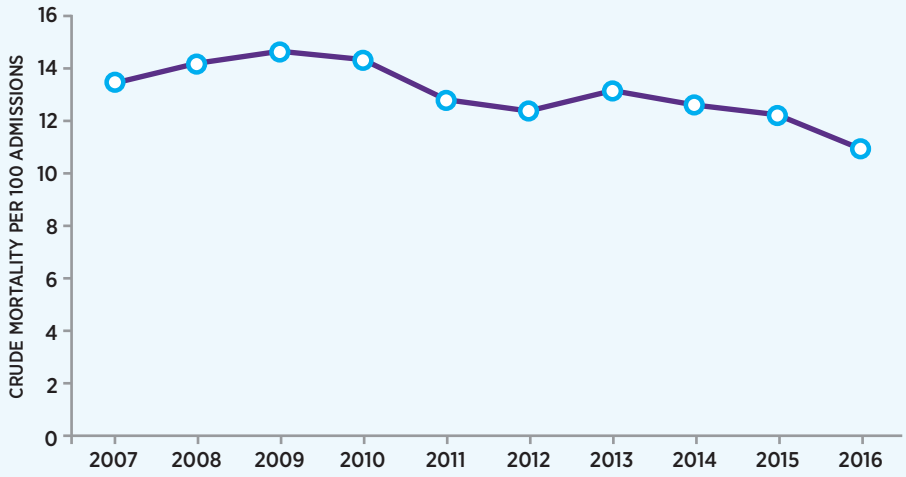
Introduction

Pneumonia is an infection that causes the tiny air sacs in the lungs, known as alveoli, to become inflamed and filled with fluid. Pneumonia can be caused by bacteria or in some cases by a virus. The very young and very old, and those with another serious health condition, are more likely to require hospital treatment (HSE, National Clinical Programme for COPD, 2017b). There are several classifications within pneumonia. The measure presented here is the SMR for pneumonia and this is fully defined in Appendix 10.

Findings: In-hospital mortality following admission with a principal diagnosis of pneumonia

From HIPE data, a crude in-hospital mortality rate for pneumonia from 2007 to 2016 is presented in Figure 16. This data has not been adjusted for differences in age profile or comorbidities over time, but it provides background information to current hospital presentations. This shows that the rate of in-hospital mortality shows a small but significant (20%) reduction over that time period (from 13.8 deaths per 100 admissions in 2007 to 11.1 deaths per 100 admissions in 2016).

FIGURE 16: NATIONAL IN-HOSPITAL MORTALITY FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF PNEUMONIA 2007- 2016



- Thirty two hospitals had over 100 patients with a principal diagnosis of pneumonia following admission in 2016. The number of admissions ranged from 110 to 796. Figure 17 presents the SMR for these hospitals in a funnel plot, with 99.8% control limits.
- The 32 hospitals included in this report represent 95% of all inpatients admitted with a diagnosis of pneumonia in 2016.
- All hospitals had an SMR within the control limits of 99.8%, indicating that all hospitals SMR's were within the expected range.
- Twelve hospitals are not included in this analysis, as they did not meet the selection criterion relating to defined number of admissions and expected events (Table 2).

FIGURE 17: NATIONAL IN-HOSPITAL SMR FOLLOWING ADMISSION WITH PRINCIPAL DIAGNOSIS OF PNEUMONIA IN 2016

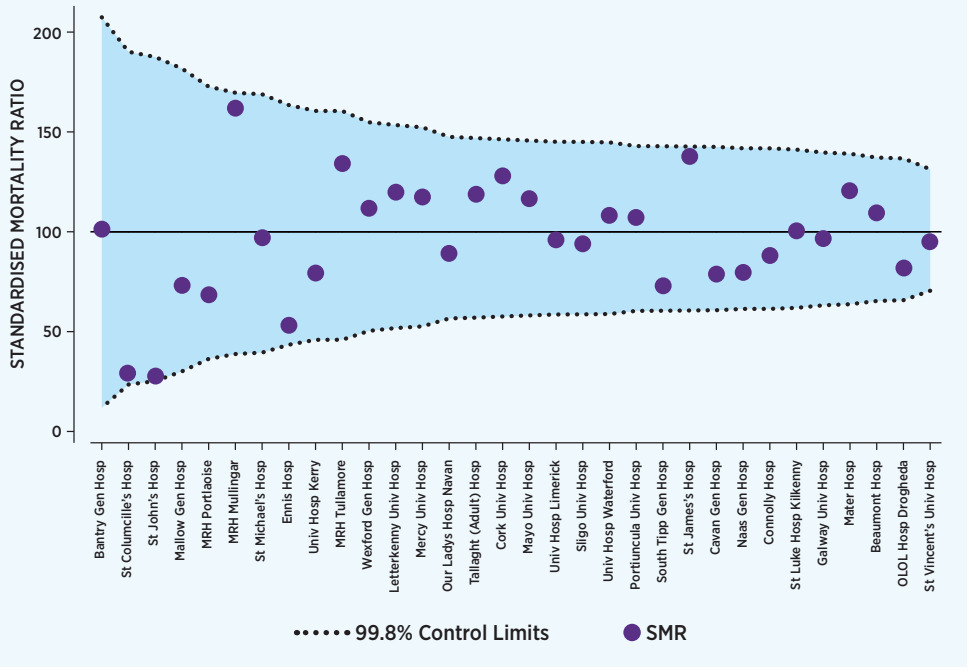


TABLE 10: TABULAR PRESENTATION FOR IN-HOSPITAL MORTALITY 2016 - PNEUMONIA

Hospital Group	Hospital Name	No. of Admissions for pneumonia 2016	SMR (99.8% Control Limits)
RCSI Hospital Group	Beaumont Hospital	525	110 (65-137)
	Cavan General Hospital	464	79 (61-143)
	Connolly Hospital	497	88 (61-142)
	Our Lady of Lourdes Hospital Drogheda	796	82 (66-137)
Ireland East Hospital Group	Mater Misericordiae University Hospital	617	121 (64-139)
	Regional Hospital Mullingar	213	162 (39-170)
	Our Ladys Hospital Navan	352	89 (57-148)
	St Columcille's Hospital	166	29 (23-190)
	St Luke's Hospital Kilkenny	605	100 (62-141)
	St Michael's Hospital	193	97 (39-169)
	St Vincent's University Hospital	740	95 (70-131)
	Wexford General Hospital	447	112 (50-155)
Dublin Midlands Hospital Group	Midland Regional Hospital Tullamore	241	134 (46-160)
	Midland Regional Hospital Portlaoise	224	68 (36-173)
	Naas General Hospital	455	80 (61-142)
	St James's Hospital	448	138 (61-143)
	Tallaght (Adult) Hospital	429	119 (57-147)
UL Hospital Group	Ennis Hospital	163	53 (43-163)
	St John's Hospital	143	28 (25-188)
	University Hospital Limerick	478	96 (59-145)
South / South West Hospital Group	Bantry General Hospital	110	101 (12-207)
	Cork University Hospital	494	128 (58-146)
	Mallow General Hospital	142	73 (30-182)
	Mercy University Hospital	340	117 (53-152)
	South Tipperary General Hospital	427	73 (60-143)
	University Hospital Kerry	273	79 (46-161)
	University Hospital Waterford	372	108 (59-145)
Saolta University Healthcare Group	Galway University Hospitals	518	97 (63-140)
	Letterkenny University Hospital	317	120 (52-153)
	Mayo University Hospital	508	117 (58-146)
	Portiuncula University Hospital	408	107 (60-143)
	Sligo University Hospital	397	94 (59-145)

Discussion

In 2015, approximately 4.5% of deaths in the over 65 age group were related to pneumonia (DOH, 2016).

HSE, NATIONAL ACUTE MEDICINE PROGRAMME

There are a large number of patients admitted to acute hospitals with pneumonia in 2016 (Table 10). The HSE National Acute Medicine Programme, in collaboration with other HSE National Clinical Care Programmes, will develop clinical decision-making resources to support standardisation and improvement of patient care. This work is ongoing.

During the timeline October 2015 – September 2016, Regional Hospital Mullingar had a statistical outlier in their pneumonia diagnosis. In line with NOCA's Monitoring and Escalation policy (NOCA, 2016) the hospital was requested to review this high SMR. A summary of their findings, endorsed by the Hospital General Manager is presented below.

REGIONAL HOSPITAL MULLINGAR

Regional Hospital Mullingar was requested by NOCA to review the hospital's pneumonia Standardised Mortality Ratio (SMR) after pneumonia mortality was noted as being higher than expected and outside of control limits during May 2016. The hospital's SMR in all patients and specifically in patients coded as respiratory and pneumonia, was higher than the national average during this time period.

Initially we convened a clinical medical morbidity and mortality steering group to discuss the findings of this report. The recommendation from this group was to conduct a detailed chart review of all patients who died whose principal (first) diagnosis was respiratory, which included pneumonia patients. Ninety nine patients were selected for review. A Consultant Respiratory Physician reviewed the 92 charts available. The review encompassed data, casemix, structures and processes of care in 2016. The mean age of the patients was 80 years, 40% were admitted from a long term care facility and over 60% were severely ill on admission.

Two areas were highlighted in this review which together account for the majority of the higher than expected mortality: the use of coding of the principal diagnosis and the inclusion of palliative care patients.

1. All of the patients included in the review had been coded as Respiratory/pneumonia patients as their principal diagnosis in HIPE. From a data perspective, the review demonstrated that the reason for admission to hospital did not always lead to the patients death. The medical department and the hospital HIPE staff have met to discuss the findings of this review and plan to meet regularly to discuss complicated patients.

2. There is no Level 3 Hospice in the Midlands Region. Within the Regional Hospital Mullingar there are two in-patient palliative care beds, exclusively for palliative care and end of life care patients. Admissions to these beds are captured on HIPE. Almost 45% of the patients included in this review had been seen formally by the palliative care team during their admission, with a number of those patients cared for in these palliative care beds at the end stages of their illness. Some of those patients would have been transferred to a hospice if a service was available in the region. This likely

impacted on mortality as those patients were counted in Regional Hospital Mullingar and would not be counted in other institutions which have hospices locally.

While this review did not highlight any concerns regarding patient care, some clinical inconsistencies were noted. Appropriate quality initiatives have been agreed and are currently being implemented.

The SMR for pneumonia at Regional Hospital Mullingar is now within the national average for 2016 and the hospital is no longer a statistical outlier. The hospital will continue ongoing reviews of mortality data and robust clinical audit of clinical care. Clinical staff will work with HIPE staff to improve more accurate coding of principal diagnosis.

Ms Shona Schneemann
General Manager
Regional Hospital
Mullingar

Dr Hilary Cronin
Clinical Director
Regional Hospital
Mullingar

Acknowledgement

NOCA

NOCA acknowledges the participation from Regional Hospital Mullingar in undertaking this process and for sharing their review.

Recommendation

- Hospitals should always triangulate NAHM to other data within their hospital and other national data collections. This can include a broader context of quality tools, such as patient experience and complaints, staff feedback and safety incident reporting.
- Increased collaboration between respiratory or other treating clinicians and clinical coders (or where available coders assigned to a speciality) will improve the quality of medical records and coding of hospital respiratory data in HIPE.

CHAPTER 8
BUILDING ON PROGRESS

CHAPTER 8

THE FUTURE OF NQAIS NAHM

For NQAIS NAHM to be sustainable and user-friendly for its intended audience, it is important to ensure that it is continually kept up to date. For this reason enhancements are continually reviewed and recommended by the NAHM Analysis and Display Scientific Team (ADST). The NAHM Governance Committee has approved the following enhancements and a funding application, prepared in collaboration with Health Intelligence, Health and Wellbeing, HSE has been made to the HSE Office of the Chief Information Officer (OoCIO) for implementation during 2018.

Application Developments

- **Interface and appearance** will be updated to include a new summary front page, additional functionality, particularly in terms of pictograms to display the metrics, and the introduction of the *Explorer* functionality, which allows the comparison of various variables in a single graphic page. Users will also be able to *bookmark* searches and retain for comparison. *Lookback* function will help the user to understand how a change to a particular signal occurred.

- **SMR and metric changes** – a new method to view SMR *changes* will be developed for all hospitals to view SMR band / cumulative summary (CUSUM) signal changes since the previous update. *Additional metrics* will allow the user have greater ability to access and display other variables on screen, such as Charlson Index and LOS.

Management developments to support the audit

- Improve presentation of the CUSUM graph
- Continual attention to CCS and codings
- A training version of NQAIS NAHM
- "Freezing" of old years
- Automatic HIPE update checker

As a system designed by clinicians for clinicians, the clinical management of the patient remains at the forefront of its thinking, but it has also proven of enormous value to hospital managers and planners. 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.

THE FUTURE OF THE NAHM AUDIT

Understanding and improving the quality of hospital based mortality data is one of the aims of NAHM. NOCA is committed to supporting hospitals to use NAHM and have reflected on areas for development which will assist in this support. Feedback from hospital users has been central in the identification of some areas for consideration such as additions to the NQAIS NAHM tool, processes for review and validation of data.

Severity of illness score

The inclusion of a severity of illness score has been requested by some hospitals and national clinical programmes. In particular, the HSE Stroke Register have introduced the capture of NIHSS which will commence in late 2017. Their aim is to objectively assess the severity of the stroke. A large number of severity of illness scoring systems have been developed and they have been used in intensive care units for many years (Bouch et al., 2008). There is a need to assess the appropriateness and fit of an illness severity score within the NQAIS NAHM tool. This should be referred to the NAHM Governance Committee for consideration.

Validation of data

Hospitals are encouraged to continuously review their NAHM data, being aware of how it may change over time and using this information to contribute to wider efforts to improve patient care.

Data is updated to NQAIS NAHM quarterly and is approximately three months in arrears. This lag allows time for data be entered onto HIPE and checks completed prior to updating to NQAIS NAHM. These timelines can present a challenge to hospitals when a breach of control limits first appears towards the year end.

Validation and analysis of the impact of corrected data on a hospitals' SMR, once the national HIPE file is closed, is not currently possible. NOCA acknowledges the concern this can cause to a hospital. NOCA wishes to support hospitals in their reviews and quality improvement and has commenced looking to international best practice and experts to assist in developing a process to support hospitals should this situation arise. Options will be explored under the NAHM Governance Committee.

Guidance for hospital reviews

To generate learning for improvement in healthcare, clinicians and staff should engage in robust processes of mortality review within their hospitals. While hospitals may currently undertake mortality reviews, there is considerable variation in terms of structures and process of these reviews and their contribution to learning and improvement. In the UK, the Healthcare Quality Improvement Partnership has commissioned a process to address this. The National Mortality Case Record Review (NMCRR) programme, a national collaborative project led by the Royal College of Physicians (RCP) in partnership with Yorkshire and Humber Academic Health Science Network's Improvement Academy and Datix, aims to develop a standardised way of reviewing the case records of adults who have died in acute hospitals across England and Scotland. (Available at: https://www.rcplondon.ac.uk/projects/national-mortality-case-record-review-programme). Under guidance of the NAHM Governance Committee, NOCA will monitor the development of this process which may be adapted to enable a more standardised follow-up for hospitals in an Irish context.

CHAPTER 8

POTENTIAL FUTURE RESEARCH IN NAHM

Future research-based analyses may explore the robustness of the current model for sensitivity of different model specifications. New analyses may provide a more detailed exploration of changes over time in hospital mortality beyond what has been presented in this report. New analysis may be shaped using hospital mortality for patients with other diseases or diagnosis than those currently considered. It could also be relevant to explore the extent to which social differences might be contributing factors to the variation in hospital mortality.

Recommendation

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

CHAPTER 9
CONCLUSION

CHAPTER 9

CONCLUSION

NOCA was established in 2012 as a key enabler of clinical effectiveness, an essential component of patient safety and quality. While national clinical audit remains relatively new in Ireland, it has long been identified as a key component to improve healthcare through systematic collection and analysis of data to see if clinical standards are met (NOCA, 2017b). Clinical audit as a core activity in the Irish healthcare system can act as a foundation for ensuring quality improvement and better patient health outcomes.

NAHM is one of a suite of indicators used for measuring hospital quality and should always be used in conjunction with other indicators of the quality of care. Hospitals, hospital groups and boards are now using their NAHM outputs to monitor hospital mortality and identify opportunities for improving patient care. One of the key messages from this report is the necessity to triangulate this data with other data sources in a hospital. While this is happening in some hospitals, there is little doubt that this could be done in a much broader context. Other indicators which may be considered can include incident reporting, patient and staff satisfaction surveys, local and national clinical audit as well as internal and external quality reviews.

Transparency is essential to system learning and development. Through NAHM, learning is occurring in hospitals and across the acute hospital system on a day by day basis. NOCA promotes transparency across all of its audits and publishes national reports (NOCA, 2017b). The first NAHM report was published in 2016 presenting hospital level information. Within this current report a number of hospitals have shared their experience of reviewing their NAHM findings. Sharing of this learning from reviews indicates a maturing clinical audit culture in our acute hospital system. Clinical and Executive Leaders in these hospitals are demonstrating commitment to a system which recognises and applies the values of learning, transparency and accountability. More importantly, it demonstrates commitment to improving the care for those cared for in the hospitals in which they work.

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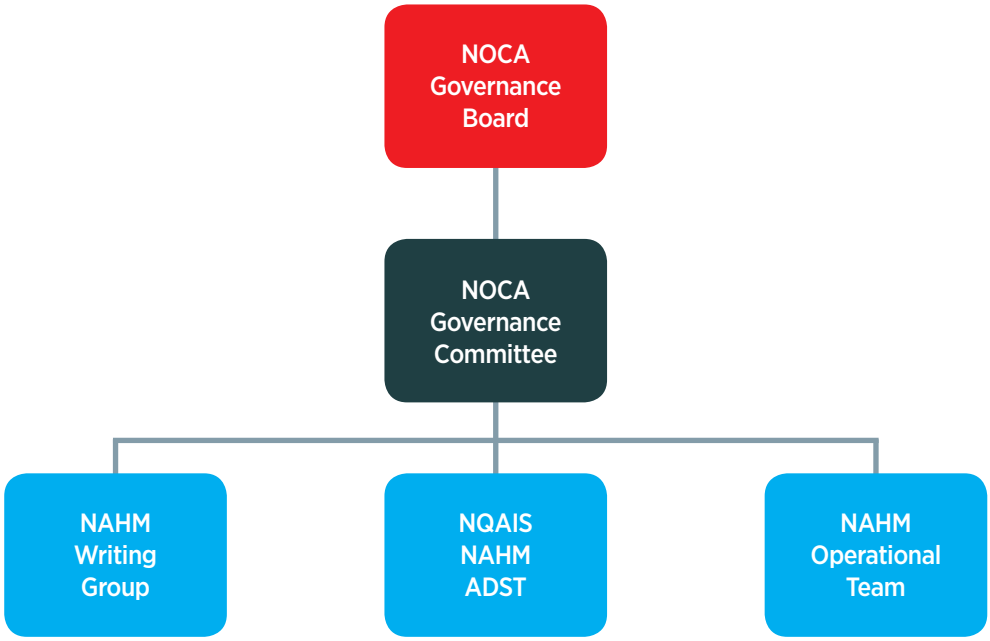
APPENDICES

APPENDIX 1: NAHM GOVERNANCE STRUCTURE

NAHM is deployed under the governance framework of NOCA. The NOCA Governance Board guides the clinical decision making and strategic direction of NOCA. It provides oversight to five national clinical audits.

NOCA has established a NAHM Governance Committee with multidisciplinary membership including clinical and executive leadership from the Irish hospitals and health service. This is supported by two sub-committees and NOCA Operational team.

- NOCA in consultation with Health Intelligence, Health and Wellbeing HSE has developed a NQAIS NAHM Analysis and Display Scientific Team (ADST). This provides specialist expertise to achieve excellence in the development and enhancement of the NQAIS NAHM tool. The membership of the team come from HIU, NOCA, NAHM Governance Committee and Software Developer. This aligns NQAIS NAHM with developments on other NQAIS projects under the Health intelligence umbrella.
- The NAHM Writing Group is a sub-committee of the NAHM Governance Committee which is convened specifically for the writing of the Annual Report.
- NAHM Operational Team oversee the day to day management of NAHM in line with NOCA polices and guidelines.



NAHM GOVERNANCE COMMITTEE MEMBERSHIP; ATTENDANCE AT GOVERNANCE COMMITTEE MEETINGS IN 2016

Name	Role/Representing Body	20 Jan 2016	20 April 2016	7 Sept 2016	12 Oct 2016	24 Oct 2016
Dr Brian Creedon, Chair	Royal College of Physicians in Ireland	✓	✓	✓	✓	✓
Margaret Brennan[2]	HSE Acute Hospitals Division	N/A	✓		✓	✓
Prof Richard Costello	Royal College of Physicians in Ireland				✓	✓
Dr Rory Dwyer	Joint Faculty of Intensive Care Medicine in Ireland	✓	✓	✓		
Ms. Bridget Egan	Royal College of Surgeons in Ireland	✓				✓
Eilísh Hardiman	Hospital Group CEO Forum	✓	✓	✓	✓	✓
Dr Howard Johnson	HSE Health intelligence Unit	✓	✓	✓	✓	✓
Prof Simon Jones	International Expert				✓	
Dr Niall Mahon	Royal College of Physicians in Ireland				✓	✓
Dr Jennifer Martin	HSE Quality Improvement Division	✓	✓	✓	✓	✓
Dr Julie McCarthy[1]	HSE Clinical Directors Programme	✓	✓	N/A	N/A	N/A
Dr Kathleen McGarry	Royal College of Physicians in Ireland	✓	✓	✓	✓	✓
Deirdre Murphy	HSE Healthcare Pricing Office	✓		✓	✓	✓
Deirdre O'Keeffe[1]	HSE Acute Hospitals Division	✓	N/A	N/A	N/A	N/A
Brian O'Mahony	Public Representative				✓	✓
A/A Prof Geraldine Shaw	HSE Office of Nursing and Midwifery	✓	✓	✓	✓	✓
Dr Barry White	Royal College of Physicians in Ireland	✓				
Deirdre Burke	In attendance: NOCA	✓	✓	✓	✓	✓
Marina Cronin	In attendance: NOCA	✓	✓	✓	✓	✓

1 Resigned from NAHM Governance Committee
2 Joined NAHM Governance Committee in 2016
N/A Representatives not yet appointed or resigned from Committee for meeting dates stated above

APPENDIX 2: METHODOLOGY FOR MEASURING IN-HOSPITAL MORTALITY

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:

- 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 (including age, gender and co-morbidities),
- Differences in the data collection (i.e. how a medical chart is completed, recorded and coded),
- Differences in the quality of care.

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

- Crude in-hospital mortality rate
- Directly standardised in-hospital mortality rate
- Indirectly standardised in-hospital mortality ratio

Crude in-hospital mortality rate

The crude in-hospital mortality rate is a measure of the number of deaths per 100 cases. It does not attempt to adjust for differences in patient populations. It is usually presented with reference to a specific disease, for example stroke or AMI. It is typically expressed as the number of deaths per 100 of the population per year.

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

*From a given 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 hospital. 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 co-morbidity) in a population of patients. This method is useful for hospitals to look at their in-hospital deaths, provided there has been no significant change in case mix in the time period in question. However, comparison of crude in-hospital death rates between hospitals is not appropriate because it does not take into consideration other important factors affecting mortality. Crude in-hospital mortality is used in this report to show the national trend.

Directly standardised mortality rate

The direct method adjusts for population differences. This method produces standardised mortality rates that these populations would have if they had the same population attributes as the standard population. Direct methods are more powerful when numbers are larger. This approach is best used for a single or otherwise homogeneous group of diagnoses and can only be standardised for a number of factors with this method.

The OECD uses the direct standardised death rate as the basis for its methodological approach (OECD, 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 comparing practice across international boundaries. This is the approach used by the Department of Health (DoH) for the National Healthcare Quality Reporting System (DoH 2017) for selected diagnoses: 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.

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 death 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 nursing home or an emergency transfer from another acute hospital) and the Charlson Index (Charlson et al., 1987), which is a measure of co-morbidity. The Charlson Index assigns a weighting to the degree to which the patient is debilitated by a number of background illnesses and conditions.

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, and
- it takes account of a larger number of variables, which impact on in-hospital mortality.

SMRs can be presented by individual hospital and 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 displayed as 100.

NATIONAL QUALITY ASSURANCE INTELLIGENCE SYSTEM

Development of NQAIS NAHM

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

NQAIS NAHM was developed by a partnership of the Health Intelligence, Health and Wellbeing, HSE and OpenApp, with input from Professor Simon Jones (Professor in Population Health, New York University), with the assistance of the specialist registrars attached to the HIU (Fitzpatrick, 2014) and (Robinson, 2016), HSE 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 to support clinicians, clinical directors and hospital managers with an evidence base in their ongoing pursuit of excellence in health care delivery.

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

NQAIS NAHM focuses on the principal/admission diagnosis (the primary reason the patient is admitted to hospital). The diagnosis is categorised into approximately 290 clinically meaningful groups based on the 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 HIU, with advice from HCUP is now available across all 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 co-morbidities based on the Charlson index (e.g. diabetes, dementia, COPD), emergency or non-emergency admission, emergency admissions within the preceding 12 months, admission source (home, nursing home or other hospital), receipt of palliative care, and an indicator of deprivation (medical card).

NQAIS NAHM 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 to explain the pattern of interest. Hospitals are provided with a simple two-page template, developed by 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, the

accuracy of the principal diagnosis, the depth of diagnostic coding which impacts on the determination of co-morbidities and difference in the overall quality of care. Clearly, the overall quality of the available data is dependent upon 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 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 each other, 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 is available, the primary focus for hospitals is the most recent rolling 12 month period.

Key data from the HIPE system is extracted to generate mortality data including SMRs for hospitals. The ICD-10-AM (8th Edition) (National Casemix and Classification Centre, 2013) classification contains approximately 16,800 codes for diagnostic conditions. Such a large number can be challenging to manage, hence SMRs are displayed by diagnostic groups. These are called CCS groups which were developed by the AHRQ. So, for example, the CCS group "acute myocardial infarction" will include conditions such as acute transmural MI, acute sub endocardial MI, MI of anterior wall or MI of inferior wall. It makes clinical sense to group together these conditions which require similar treatment approaches.

The SMR used in NQAIS NAHM includes the analysis of patients coded for palliative care which differs from some international models, where patients who are coded for palliative care are excluded from analysis. The inclusion of palliative care coded patients ensures that potential "gaming" (where there is a referral to palliative care which excludes cases from review for SMR purposes) cannot take place and also recognises that palliative care coding does not equivocate to end of life care (Chong et al., 2012).

Hospital mortality data is presented in numerical and graphical format for selected time periods, usually one year. NAHM only publishes data using the 99.8% limit statistical test.

NQAIS NAHM also presents a 'more liberal' 95% control limit banding. This is to give clinicians and managers the ability to closely monitor the mortality pattern for an early warning of potential areas of concern.

Where an SMR is outside the expected range, hospitals should examine their records 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. Within NQAIS NAHM, there is the capability to identify records which can focus a review of mortality patterns. Hospitals are provided with a template to guide the review process and to facilitate sharing of the learning points.

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APPENDIX 3: SMR FUNNEL PLOT

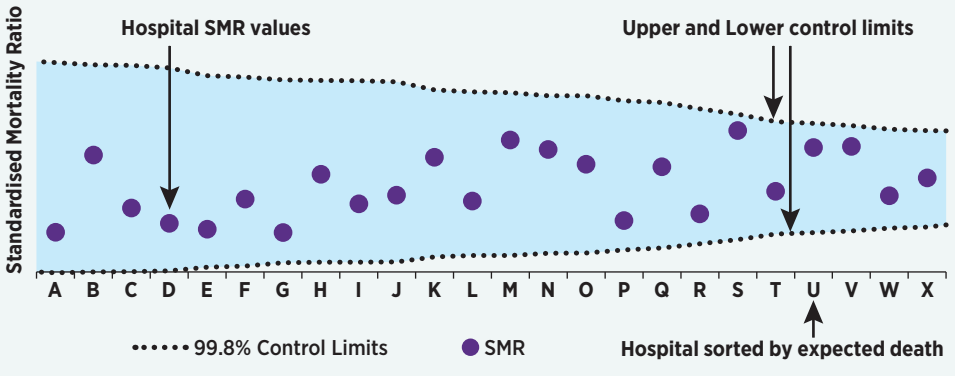
SMR Funnel plot

For this report, SMR funnel plots are scatterplots of individual hospital's SMR. 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 an individual diagnosis in hospitals. Hospitals with smaller numbers of cases have wider control limits and appear to the left of the SMR funnel plots, while hospitals with larger number 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 of institutions into 'league tables' (Spiegalhalter 2005), therefore it is not valid to directly compare SMRs between hospitals.

SAMPLE NATIONAL FUNNEL PLOT



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APPENDIX 4: HPO NOTE ON SEQUENCING OF AMI CODES

SEQUENCING OF MYOCARDIAL INFARCTION VS CORONARY ARTERY DISEASE AS THE PRINCIPAL DIAGNOSIS ON HIPE.

The principal diagnosis of an episode of care in HIPE is defined as '"The diagnosis established after study to be chiefly responsible for occasioning an episode of admitted patient care, an episode of residential care or an attendance at the health care establishment, as represented by a code" (Australian Institute of Health and Welfare, 2012).' (Source Australian Coding Standard 0001), Principal Diagnosis. The phrase 'after study' indicates that if an underlying cause is found this will become the principal diagnosis.

In addition ACS 0001 further states, referencing World Health Organisation guidelines:

TWO OR MORE INTERRELATED CONDITIONS, EACH POTENTIALLY MEETING THE DEFINITION FOR PRINCIPAL DIAGNOSIS

When there are two or more interrelated conditions (such as diseases in the same ICD-10-AM chapter or manifestations characteristically associated with a certain disease) potentially meeting the definition of principal diagnosis, the clinician should be asked to indicate which diagnosis best meets the principal diagnosis definition. If no further information is available, code as the principal diagnosis the first mentioned diagnosis (World Health Organization 2011, pp. 133–134).

References:

Australian Institute of Health and Welfare (2012) National Casemix and Classification Centre, University of Wollongong (2013), Australian Coding Standard 0001 Principal Diagnosis, ICD-10-AM/ACHI 8th Edition.

APPENDIX 5: ACUTE MYOCARDIAL INFARCTION

AMI: INDICATOR

Definition	Standardised mortality ratio with a principal diagnosis of AMI
Years covered	2016
ICD-10-AM code	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

APPENDIX 6: HEART FAILURE

HEART FAILURE INDICATOR

Definition	Standardised mortality ratio with a principal diagnosis of heart failure
Years covered	2016
ICD-10-AM code	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

APPENDIX 7: ISCHAEMIC STROKE

ISCHAEMIC STROKE INDICATOR

Definition	Standardised mortality ratio with a principal diagnosis of ischaemic stroke
Years covered	2016
ICD-10-AM code	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.

APPENDIX 8: HAEMORRHAGIC STROKE

HAEMORRHAGIC STROKE INDICATOR

Definition	Standardised mortality ratio with a principal diagnosis of haemorrhagic stroke
Years covered	2014-2016
ICD-10-AM code	I60, I600, I601, I602, I603, I604, I605, I606, I607, I608, I609, I61, I610, I611, I612, I613, I614, I615, I616, I618,
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.

APPENDIX 9: COPD

COPD INDICATOR

Definition	Standardised mortality ratio with a principal diagnosis of COPD
Years covered	2016
ICD-10-AM code	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 & mucopurulent chronic bronchitis', 'Simple chronic bronchitis', 'Mucopurulent chronic bronchitis', 'Mixed simple & 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.

APPENDIX 10: PNEUMONIA

PNEUMONIA INDICATOR

Definition	Standardised mortality ratio with a principal diagnosis of pneumonia
Years covered	2016
ICD-10-AM code	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 (J17.3*)', '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.

APPENDIX 11: GLOSSARY

ABF	Activity Based Funding
ACS	Acute Coronary Syndrome
ADST	Analysis and Display Scientific Team
AHRQ	Agency for Healthcare Research and Quality
AMI	Acute Myocardial Infarction (Heart Attack)
CAD	Coronary Artery Disease
CCS	Clinical Classifications Software
CSO	Central Statistics Office
COPD	Chronic Obstructive Pulmonary Disease
CUSUM	Cumulative Summary
GOLD	Global Initiative for Chronic Obstructive Lung Disease
HIPE	Hospital In-Patient Enquiry system
HIU	Health Intelligence, Health and Wellbeing, HSE
HPO	Healthcare Pricing Office
ICD 10 AM	International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification
KPI	Key Performance Indicator
LOS	Length of Stay
NAHM	The National Audit of Hospital Mortality. A structured review and evaluation of care as part of clinical audit cycle
NCCH	National Centre of Classification in Health
NIHSS	National Institute of Health Stroke Scale
NOCA	National Office of Clinical Audit
NQAIS	National Quality Assurance Intelligence System. A suite of audit and performance monitoring tools developed by the Health Intelligence, Health and Wellbeing, HSE
NQAIS NAHM	The National Quality Assurance Intelligence System for Hospital Mortality
OoCIO	Office of the Chief Information Officer
OECD	Organisation for Economic Cooperation and Development
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
Univ	University

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