Final Report

Implementation of ICD-10-AM coding in the Emergency Department in Midland Regional Hospital Tullamore and the grouping of the data to Urgency Related Groups

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3 BACKGROUND

Activity within emergency departments (ED) is currently block funded and there is not sufficiently consistent or appropriate activity data nationally to classify ED care for Activity Based Funding (ABF) at present. It is part of the ABF implementation plan 2021-2023 and Sláintecare Implementation Strategy to broaden the scope of ABF to include EDs.

Since 2016, the Healthcare Pricing Office (HPO) has been working with the Emergency Medicine Programme (EMP) to determine an approach to classify ED activity as a building block for ABF. Following an international review, it was agreed that Ireland will adopt the Australian Urgency Related Group (URG) classification system developed by the Australian Independent Hospital Pricing Authority (IHPA) for ED activity, on the basis that the system is a relevant and mature model well-suited to Irish healthcare, noting in particular its alignment with Australian Refined Diagnosis Related Groups (AR-DRGs) already used in Ireland to classify admitted acute care. The main variables required for the URG system are episode end status, type of visit, triage category, diagnosis and sex.

The Australian ED ICD-10-AM Principal Diagnosis Short List (ED Short List) is used to report the diagnosis variable required for this URG system. The ED Short List is designed to ensure a consistent approach to the reporting of principal diagnosis for ED presentations. It was used in a pilot feasibility project to test clinical coding in ED and the suitability of the URG system for use in Ireland.

The project in the Emergency Department at Midland Regional Hospital Tullamore (MRHT) ran from September until present and the data obtained is reviewed in this report. The purpose of the pilot was to:

- Investigate the feasibility of assigning diagnoses from the ED Short List by Emergency Medicine (EM) clinicians to all ED attendances
- Assess the usability of the Integrated Patient Management System (IPMS) for the recording of diagnosis codes
- Compare URG and Patient Experience Time (PET) fields to confirm feasibility of using PET data for ABF
- Investigate whether pilot data can be grouped to URGs

3.1 OVERVIEW OF THE AUSTRALIAN CLASSIFICATION SYSTEM:

In Australia, classifications were first developed in the 1990s, and some were refined over time. However, they were not widely adopted as the basis for funding until recent years in individual states, and not until 2012 nationally. The classification currently used for activity based funding nationally for emergency departments in Australia is Urgency Related Groups (URGs).
A URG code is determined by five factors:

1. **Episode End Status** – what happened to the patient once the ED presentation was finished (e.g. admission, did-not-wait, non-admitted)
2. **Type of Visit** – the type of patient presentation (e.g. emergency, dead on arrival)
3. **Triage category** – how urgently the patient needed to receive treatment
4. **Sex**
5. **Diagnosis Code and Diagnosis Type** (to identify the diagnosis code reported)

This combination of data elements results in 114 groups. Grouping to URGs requires data to be reported at the episode level for each patient.

The IHPA, through HPO, have generously shared all their research and algorithms which avoids huge amounts of duplication.

3.2 METHODOLOGY

The data the HPO required for the pilot was obtained through the PET data from the Business Information Unit (BIU). Through the PET steering group, it was agreed that the PET data points should be expanded to collect triage and diagnosis for information purposes primarily but also for ABF purposes. PET data is returned daily to BIU and BIU sent a weekly transfer of coded data to the HPO throughout the pilot.

MRHT was selected as the first site to pilot the use of the ED Short List based on the cooperation and willingness of the EM clinicians in Tullamore. An Aspire Fellow in Clinical Informatics in Emergency Medicine was recruited to lead the project at the site.

The descriptors associated with each diagnosis code on the ED Short List were initially reviewed for clinical applicability and refined to optimise searches, without modifying the underlying coding schema.

The Acute Operations IPMS team reviewed the ED Short List and tested how it could be captured on IPMS, using a module called Coding. Once successfully tested, instructions were provided to the IPMS System Administrator at MRHT who made the codes available for selection by the EM clinicians. The process of locally uploading the ED Short List required approximately 24 hours of administrator time.

The IPMS Technical team developed two new reports to support the pilot called MRHT Discharge Coding Code and MRHT Discharge Coding Daily. This development process took approximately 18.5 hours of technical specialist time.

Training was provided to all EM clinicians with discharge privileges at MRHT, which included both Advanced Nurse Practitioners and Registered Medical Practitioners. A formal didactic session on the principles of selecting appropriate discharge diagnoses from the ED Short List generally, following the IHPA's model, was accompanied by training specifically on the use of the IPMS Coding module to assign these codes. Recorded training videos and summary fact sheets were also prepared to support the clinicians at MRHT.

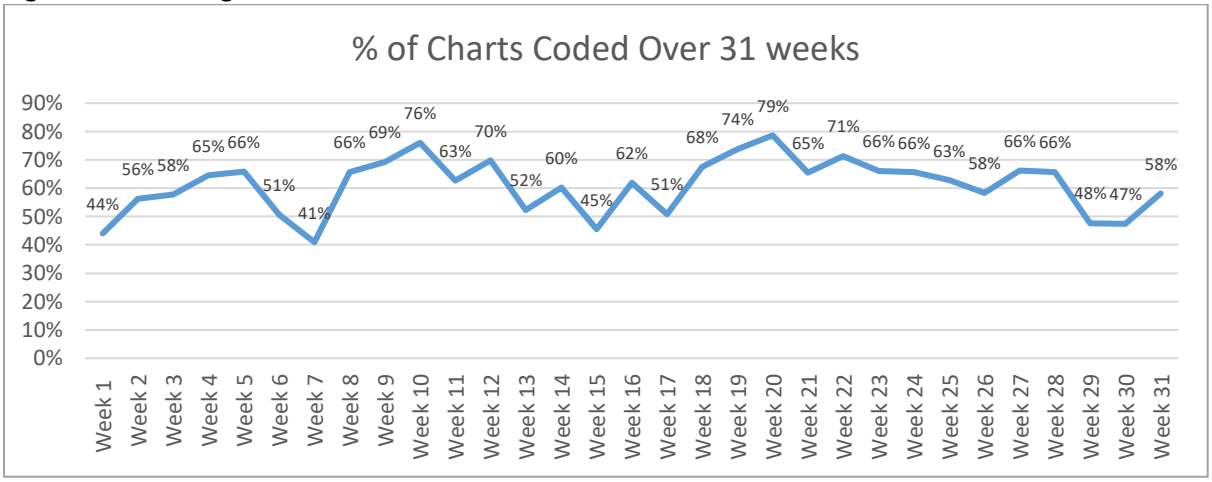
After the go-live date of 21st September 2021, the percentage of care episodes with assigned diagnosis codes was tracked on a weekly basis over approximately 31 weeks. Generic reminders were sent to the clinical team, with support provided on a one-to-one basis on the clinical floor for troubleshooting process issues that arose. Tailored reminders were sent to clinicians with low coding compliance to support improved uptake.

A formal evaluation of the EM clinician experience of using IPMS for discharge diagnosis coding was then conducted in March 2022, with ethical approval provided by the Irish College of General Practitioners on behalf of MRHT (ICGP_REC_21_0047).

4 PILOT ASSESSMENT

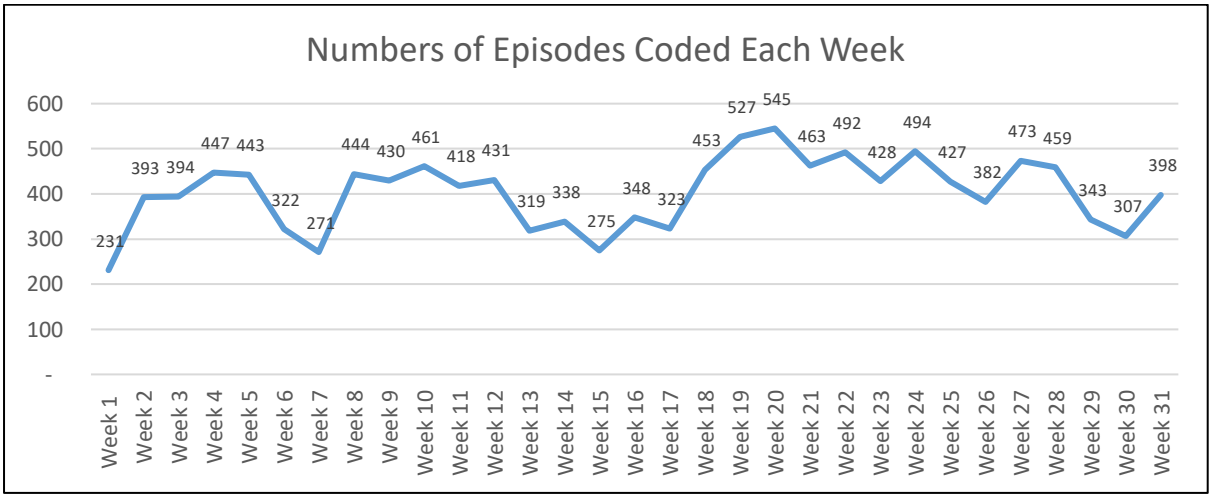
The pilot began in MRHT on the 21st September 2021. For the purpose of this report we have included data up until the 23rd April 2022 (excluding cases that have not yet been discharged). This amounted to approximately 31 weeks of coding. Figure 1 and 2 below shows the percentage of cases coded and the number of episodes each week respectively.

Figure 1: Percentage of charts coded over 31 weeks



Source: BIU PET data. Week 1 only has 5 days

Figure 2: Number of episodes coded each week



Source: BIU PET data. Week 1 only has 5 days

A total of 12, 479 (61%) episodes were coded out of 20,401 episodes (excluding those who did not wait) for the entire period. Coding improved over time, with a high of 79% of episodes coded in week 20.

A range of reasons exist why complete coding coverage was not achieved, including an initial wash-in onboarding period, which recurred following the NCHD staffing changeover in January, workload pressures on clinicians during overnight shifts and the Christmas holiday period especially, access to adequate numbers of computer workstations, and locum clinicians backfilling shifts who had not received coding training.

4.1 GROUPER VARIABLES

4.1.1 Diagnosis Code

Over the 31 weeks 766 or 67% of the 1,136 codes available in the shortlist were used. The table below shows the Top 20 diagnoses codes used over the period. These top 20 account for 3,573 episodes, approximately 18% of the total episodes (excluding those who did not wait). As mentioned previously approximately 61% of total episodes were coded during the period.

Table 1: Top 20 Diagnosis Codes

Diagnosis	**N**	**%**
S809 Superficial injury of lower leg, unspecified	373	1.8%
S9340 Sprain and strain of ankle, part unspecified	333	1.6%
R074 Chest pain, unspecified	327	1.6%
S5230 Fracture of shaft of radius, part unspecified	290	1.4%
U071 Emergency use of U07.1	277	1.4%
S609 Superficial injury of wrist and hand, unspecified	251	1.2%
J22 Unspecified acute lower respiratory infection	213	1.0%
N390 Urinary tract infection, site not specified	185	0.9%
M545 Low back pain	165	0.8%
K291 Other acute gastritis	157	0.8%
R55 Syncope and collapse	143	0.7%
S6260 Fracture of phalanx, part unspecified	142	0.7%
S836 Sprain and strain of other and unspecified parts of knee	128	0.6%
R040 Epistaxis	125	0.6%
S610 Open wound of finger(s) without damage to nail	124	0.6%
S6358 Sprain and strain of other parts of wrist	110	0.5%
I8020 Phlebitis and thrombophlebitis of deep vessels of lower extremities, not elsewhere classified	108	0.5%
R69 Unknown and unspecified causes of morbidity	102	0.5%
F072 Postconcussional syndrome	100	0.5%
S826 Fracture of lateral malleolus	100	0.5%

Source: BIU PET data

4.1.2 Episode End Status

The Discharge Destination field in the PET data was used to map to the Episode End Status variable used in the URG grouper. The table below shows the mapping of the episodes.

Table 2: Episode End Status Mapping

Discharge Destination	**Episode End Status**	**N**	**%**
Admitted to Ward	1 Admitted to this hospital (including to units or beds within the emergency department)	4,620	21.0%
Death (in ED)	6 Died in emergency department as a non-admitted patient	16	0.1%
Did Not Wait	4 Did not wait to be attended by a health care professional	1,541	7.0%
Did Not Wait	5 Left at own risk after being attended by a health care professional but before the non-admitted patient emergency department services episode was completed	91	0.4%
Discharged / Transferred to another hospital	3 Non-admitted patient emergency department service episode completed – referred to another hospital for admission	360	1.6%
Discharged Home	2 Non-admitted patient emergency department service episode completed – departed without being admitted or referred to another hospital	13,767	62.5%
Discharged to Other place	8 Registered, advised of another health care service, and left the emergency department without being attended by a health care professional	97	0.4%
Discharged to nursing Home	2 Non-admitted patient emergency department service episode completed – departed without being admitted or referred to another hospital	63	0.3%
Not Specified	9 Not stated/inadequately described	1	0.0%
Referred to AMU	1 Admitted to this hospital (including to units or beds within the emergency department)	4	0.0%
Referred to ED Clinic	2 Non-admitted patient emergency department service episode completed – departed without being admitted or referred to another hospital	128	0.6%
Referred to OPD	2 Non-admitted patient emergency department service episode completed – departed without being admitted or referred to another hospital	1,345	6.1%

Source: BIU PET data

4.1.3 Type of Visit

The Attendance Type field in the PET data was used to map to the Type of Visit variable used in the URG grouper. The table below shows the mapping of the episodes.

Table 3: Type of Visit Mapping

Attendance Type	Type of Visit	N	%
New	1 Emergency presentation	20,738	94.1%
Return	2 Returned visit, planned	575	2.6%
Unscheduled Return	1 Emergency presentation	720	3.3%

Source: BIU PET data

The Type of Visit variable in the URG grouper is more granular than Attendance Type in the PET data. The categories of 3 Pre-arranged admission and 4 Patient in transit in the Type of Visit cannot be determined from the PET data.

4.1.4 Triage category

The Triage Category field in the PET data was used to map to the Triage Category variable used in the URG grouper. The table below shows the mapping of the episodes.

Table 4: Triage Mapping

PET Triage Category	URG Triage variable	N	%
1 Triage Category: Immediate	1 Resuscitation: Immediate (Within seconds)	66	0.3%
2 Triage Category: Very Urgent within 10 mins	2 Emergency: Within 10 minutes	4,443	20.2%
3 Triage Category: Urgent within 1 hr	3 Urgent: Within 30 minutes	12,152	55.2%
4 Triage Category: Standard within 2 hrs	4 Semi-urgent: Within 60 minutes	5,037	22.9%
5 Triage Category: Non Urgent within 4 hrs	5 Non-urgent: Within 120 minutes	248	1.1%
6 Triage Category: Unspecified Not triaged	9 Triage Category – not assigned	87	0.4%

Source: BIU PET data

4.1.5 Sex

The Gender field in the PET data was used to map to the Sex variable used in the URG grouper. The table below shows the mapping of the episodes.

Table 5: Sex Mapping

Gender	Sex	N	%
F Female	2 female	10,804	49.04%
M Male	1 male	11,229	50.96%

Source: BIU PET data

4.2 GROUPING TO URGENCY RELATED GROUPS

The data from the period grouped to 98 Non-Error URG out of 114 Non-Error URGs available (86%). 14,592 (66% approx.) episodes were assigned to a Non-Error URG. Below is the Top 20 URGs accounting for 52% of the total episodes approximately.

Table 6: Top 20 URGs

URG	URG Description	N	%
058	N-A_T4_Injury	2,133	9.68%
050	N-A_T3_Injury	1,939	8.80%
073	Did Not Wait	1,638	7.43%
056	N-A_T3_Musculoskeletal/connective tissue illness	658	2.99%
052	N-A_T3_Gastrointestinal system and Digestive system illness	636	2.89%
057	N-A_T3_All other MDB groups	594	2.70%
078	N-A Return visit, planned – Triage 3-5	493	2.24%
048	N-A_T3_Circulatory system and Endocrine, nutritional and metabolic illness	450	2.04%
044	N-A_T2_Injury	369	1.67%
043	N-A_T2_Circulatory system / Endocrine, nutritional and metabolic diseases	302	1.37%
055	N-A_T3_Respiratory system illness	302	1.37%
063	N-A_T4_Musculoskeletal/connective tissue illness	298	1.35%
051	N-A_T3_Genitourinary illness	230	1.04%
053	N-A_T3_Neurological illness	224	1.02%
010	Adm_T2_Injury	215	0.98%
016	Adm_T2_Circulatory system and Endocrine, nutritional and metabolic illness	212	0.96%
104	N-A_T3_Blood/immune system illness/system infection/parasites	206	0.93%
046	N-A_T2_All other MDB groups	195	0.89%
024	Adm_T3_Circulatory system illness and endocrine, nutritional and metabolic illness	193	0.88%
012	Adm_T2_Respiratory system illness	178	0.81%

7,441 (34% approx.) episodes grouped to Error URGs mainly due to a missing diagnosis code, see table below.

Table 7: Error URGs

URG	URG Description	N	%
E3	Error – Blank diagnosis code	7,428	33.71%
E2	Error – Triage not (1, 2, 3, 4 or 5)	9	0.04%
E8	Error – Diagnosis code not recognised	3	0.01%
E1	Error – Episode End Status not (1, 2, 3, 4, 5, 6, 7 or 8)	1	0.00%

The following URGs did not appear in the pilot data

Table 8: URGs that did not appear

URG	URG Description
022	Adm_T3_Obstetric/Gynaecological illness
030	Adm_T4_Poisoning/Toxic effects of drugs
037	Adm_T5_All other MDB groups 1
038	Dead on Arrival w any Triage w any MDB
079	Adm_T1_Psychiatric illness
089	Adm_T4_Gynaecological and Male reproductive system illness
090	Adm_T4_Psychiatric illness
091	Adm_T5_All other MDB groups 2
093	Adm_T5_Gastrointestinal system and Digestive system illness
094	Adm_T5_Psychiatric illness
110	N-A_T4_Obstetric and Newborn/Neonate
117	N-A_T5_Blood/immune system illness/system infection/parasites
118	N-A_T5_Obstetric illness/Newborn/Neonate
119	N-A_T5_Genitourinary system illness
120	N-A_T5_Psychiatric illness
123	Transfer presentation_5

The absence of these URGs reflects the casemix of the catchment area population, the services provided at MRHT, and the process of assigning triage categories using the Manchester Triage System which is in widespread use in Ireland.

MRHT does not have inpatient neonatal, gynaecologic/obstetric, medical paediatric or psychiatric services, so patients from these categories who present to MRHT requiring admission would be transferred to an alternative institution and fall within URGs 74 or 121-123 instead (transfer presentation). Hence for example URGs 022, 079, 090 or 094 are not represented in MRHT data.

Secondly, the Manchester Triage System uses discriminators for each major presenting complaint to determine the clinical urgency by which a patient should be seen. A patient presenting with mental illness must be triaged at a minimum of category 4, hence URG 120 (non-admitted, triage category 5 with psychiatric illness) will not arise.

4.3 EVALUATION OF EM CLINICIAN EXPERIENCE

4.3.1 Demographics

32 EM clinicians were invited to participate in a fully anonymous web-based evaluation of the diagnosis coding pilot using IPMS at MRHT. This included NCHD staff members who had participated in the project but rotated to other clinical posts following the January 2022 staffing changeover.

Fully completed responses were received from 21, giving a response rate of 66%. Eight respondents had more than ten years clinical experience; nine had 6-10 years of clinical experience; four had 3-5 years of clinical experience.

4.3.2 IPMS Coding module usability

4.3.2.1 Current usability

The System Usability Scale is a validated and widely used metric to evaluate computer interface usability perception (Brooke, 1996, Brooke, 2013). A raw score of 68 represents the average (at the 50th percentile) across all human-computer interaction interfaces (Sauro, 2018).

The average raw score assigned by respondents to the IPMS coding module was 63.9, which is considered marginally acceptable and falls in the 35-40 percentile.

4.3.2.2 Specific usability issues

Sixteen respondents reported that usability of the IPMS coding module could be improved.

To explore usability in a more actionable way, respondents were asked to indicate their opinions on a range of statements, summarised in the frequency table below:

Table 9: Frequency table of usability responses

Question	**Strongly disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
There were too many steps needed to assign each code	1	6	5	7	2
Knowing how to search for codes is straightforward	0	7	5	8	1
Coding is too time consuming to use regularly	2	6	7	4	0

In IPMS, there are currently three distinct pathways to assign a diagnosis code depending on whether the clinician wishes to discharge the patient from IPMS, refer the patient for admission, or assign a code after the patient has been discharged. These responses show a trend towards dissatisfaction with the number of steps involved.

Opinions on the searchability of the ED Short List through IPMS are distributed evenly with no overall trend.

Clinicians did not find the time required to assign a diagnosis code prohibitive, with fifteen of the sample either neutral or disagreeing with the statement that the process is too time consuming.

4.3.3 Overall coding process

Sixteen respondents required no further assistance after training, indicating the effectiveness of the training supports designed and provided.

Ten respondents indicated problems with the coding process generally. A frequent theme from respondents related to use of the ED Short List, especially the perceived absence from the list of specific diagnosis codes, as cited by seven respondents. Others also mentioned needing to use symptom codes rather than diagnosis codes from the ED Short List due to patient acuity mix, as well as uncertainty over the correct coding method for multiple diagnoses for a single patient.

Table 10: Frequency table of general coding issues

Question	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
All essential codes are present on the list	2	10	4	4	0
Discharge coding should be performed by clerical staff rather than EM clinicians	2	7	8	1	0

Despite these issues, a majority of respondents did not feel that diagnosis coding was a role which should be performed by clerical rather than clinical staff.

4.3.4 Suggestions for improvement

A free-text area was provided to suggest improvements. Following thematic analysis, three major areas were identified.

Four respondents suggested that assignment of diagnosis codes be made mandatory through use of technical checkpoints requiring a code entry before a patient can be discharged or referred. While this is currently possible in IPMS, a decision was made not to mandate coding due to the potential downstream impact on PET data if codes were not assigned in a timely way.

Five respondents advocated streamlining the number of steps required to assign a diagnosis code, which would not be possible at present without IPMS programme redesign.

Five respondents advised that increasing the selection of available diagnoses on the ED Short List would making the coding process easier, reduce the time spent searching for correct codes, and improve the granularity of the data obtained.

4.4 BENEFITS OF CLINICALLY CODED DATA

The coding of ED discharges allows the assignment of URGs in the ED setting however the more important benefits of clinically coded data are

a) Patient level and clinical meaningful description of ED activity
b) Gives a more complete view of patient journey through the hospital
c) Provides information to EM clinicians for planning and management purposes
d) Supports more detailed analysis for winter planning
e) With the introduction of IHI patient transitions between community and ED and Acute settings can be viewed.

5 CONCLUSION & LESSONS LEARNED

It is feasible for EM clinicians to assign principal discharge diagnosis codes to each patient episode on a real-time basis. The IPMS provides a workable technical solution to achieve this, but with the caveat that its usability shows marginal acceptability due to the number of process steps involved. The ED Short List can be incorporated within IPMS and used by clinicians, although the spread of diagnoses it contains may not give sufficient detail for clinical research and audit, as distinct from ABF or service planning requirements.

The learning from this pilot feasibility project at MRHT can be used to implement the ED Short List for coding in other hospitals which use IPMS as their main ED patient tracking system.

The BIU PET data with diagnoses and triage can be used to group to URGs with the majority of coded data being assigned a URG. The coding of episodes needs to be maximised in order for the data to be grouped to a Non-Error URG. Further investigation is needed to determine whether a further breakdown of the PET fields is necessary to match the granularity of the URG variables.

To improve data completeness and clinical utility, two areas must be considered:

1. Implementing a technical checkpoint to mandate assignment of a diagnosis code prior to a patient's discharge or referral for admission. This would be better enforced through a dedicated Acute Floor Information System (AFIS), or similar product, where technical design could also optimise usability.
2. This phase of the pilot project has been carried out based on the ICD 10 AM short ED short list of codes. This decision was made for reasons of practicality in that there was no equivalent SNOMED short list available at the time of commencement and proven mappings from SNOMED to ICD 10 AM were not available. It is the intention that the ICD 10 AM shortlist will continue to be used for this pilot work to ensure comparability across sites. In parallel the project team will work with the HSE SNOMED CT to examine the development of a SNOMED ED shortlist and mapping from SNOMED to ICD 10 AM. The pilot data can be used to test any mappings. Once these are developed and in place a decision can be made on transitioning from SNOMED to ICD. It is recognised however, that SNOMED will be the standard used in the AFIS system and where sites adopt the AFIS system SNOMED codes will be mapped to the ICD 10 AM shortlist for ABF purposes.

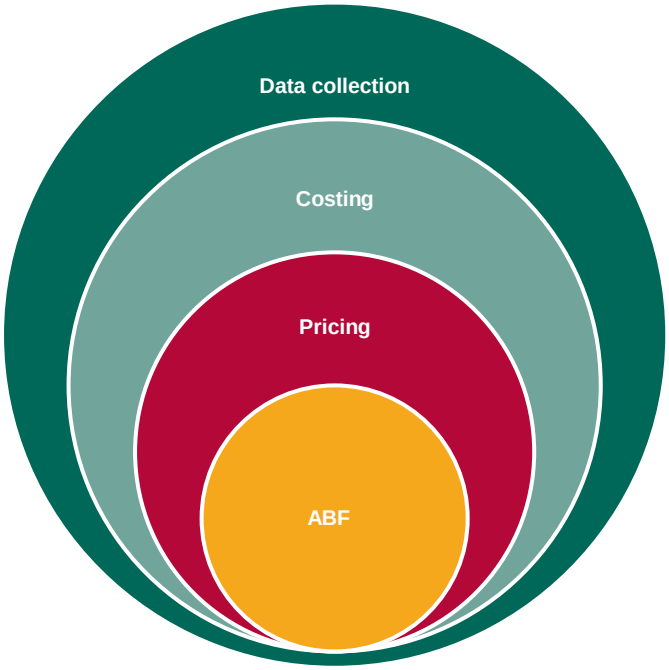
6 NEXT STEPS

Following on from the success of the pilot MHRT, the following next steps are proposed:

1. Identify suitable sites to expand the shortlist pilot, taking the following factors into consideration
    a) Proactive EM clinicians
    b) Representation of patient cohorts
    c) Availability of Patient Level Costing data
    d) Regional spread
2. Develop a methodology of costing the pilot activity
3. Examine the Australian cost weights for suitability for use in Ireland
4. Examine ED data across sites for consistency
5. ABF cost comparison across pilot sites and eventually shadow funding

The diagram below shows the components for developing ABF in EDs

Figure 3: Components of ABF



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8 APPENDIX 1 – ED ABF WORKING GROUP MEMBERS

Midland Regional Hospital Tullamore	
Thomas Mac Mahon	Aspire Fellow in Clinical Informatics
Robert Eager	UL Adjunct Associate Clinical Professor, Consultant in Emergency Medicine
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Mark O'Connor	Head of Costing
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Joan Molloy	General Manager
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