



An Roinn Sláinte
Department of Health

Irish Maternity Early Warning System (IMEWS) V2

National Clinical Guideline No. 4

Summary February 2019

The Irish Maternity Early Warning System (IMEWS) Version 2 National Clinical Guideline (NCG) has been updated by the Childbirth Guideline Development Group (GDG), established under the auspices of the HSE National Clinical Programme for Obstetrics and Gynaecology.

The original IMEWS was developed under the auspices of the Health Service Executive Acute Hospitals Directorate as a collaborative project between the Office of Nursing and Midwifery Director and the National Clinical Programme in Obstetrics and Gynaecology. The IMEWS clinical practice guideline was first published in 2013 and was subsequently updated, quality assured and published as a National Clinical Effectiveness Committee (NCEC) NCG No. 4 IMEWS in November 2014.

Using this National Clinical Guideline

This summary should be read in conjunction with the full version NCEC NCG. The full version is available at: <https://health.gov.ie/national-patient-safety-office/ncec/national-clinical-guidelines/>. The complete list of references and appendices can be found in the full version. Only the relevant appendices are in this summary. This summary NCG applies to women with a confirmed clinical pregnancy and for up to 42 days in the postnatal period, irrespective of age or reason for presentation. Exclusions are women in labour, high dependency, recovery and critical care settings. This NCG is relevant to all clinical staff in hospitals providing care to those women.

NCEC NCG No. 4 IMEWS V2 supersedes all previous versions.

Disclaimer

NCEC NCGs do not replace professional judgment in particular cases, whereby the clinician or health professional decides that individual guideline recommendations are not appropriate in the circumstances presented by an individual patient. In circumstances whereby an individual patient declines a recommendation as a course of action in their care or treatment plan, the decision not to follow a recommendation should be recorded appropriately in the patient's healthcare record.

Users of NCEC National Clinical Guidelines must ensure they have the current version (hardcopy or softcopy) by checking the relevant section in the National Patient Safety Office on the Department of Health website: <https://health.gov.ie/national-patient-safety-office/ncec/national-clinical-guidelines/>

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Membership of the Guideline Development Group (GDG)

The Childbirth GDG was chaired by Professor Michael Turner, Lead, Clinical Programme Obstetrics and Gynaecology. This National Clinical Guideline was supported by the Clinical Programme for Obstetrics and Gynaecology, the Institute of Obstetrics and Gynaecologists and the National Women and Infants Health Programme.

Membership nominations were sought from a variety of clinical and non-clinical backgrounds to represent stakeholders within the maternity services. GDG members included those involved in obstetrics, midwifery, anaesthetics, neonatology, clinical risk, quality assurance, Clinical Indemnity Scheme, education, the National Women and Infants Programme and two representatives of maternity service users (Table 1).

Table 1: Members of the Childbirth GDG

Name	Job title and affiliation
Professor Michael Turner (Chair)	Lead, Clinical Programme Obstetrics & Gynaecology
Dr Peter Boylan	Chair, Institute of Obstetricians and Gynaecologists
Ms Triona Cowman	Director, Centre for Midwifery Education
Ms Anna Deasy	Clinical Risk Manager, Coombe Women and Infants University Hospital
Ms Angela Dunne	Midwifery Director, National Women and Infants Health Programme
Ms Mary Flynn	Assistant Director of Midwifery, Cork University Maternity Hospital
Dr Jennifer Hogan	Specialist Registrar Obstetrics and Gynaecology
Prof Joan Lalor	Professor of Midwifery, Trinity College Dublin
Ms Connie McDonagh	Director of Midwifery, Kilkenny
Ms Niamh McGoldrick	Service User
Mr Kilian McGrane	Director, National Women and Infants Health Programme
Ms Elaine McGrath	Service User
Dr Peter McKenna	Clinical Director, National Women and Infants Health Programme
Dr Léan McMahon	Quality Assurance, National Women and Infants Health Programme
Dr Niamh Murphy	Specialist Registrar Obstetrics and Gynaecology
Dr John Murphy	Lead, Clinical Programme for Neonatology
Ms Margaret Philbin	Director of Midwifery, Rotunda
Ms Caroline Plascott	Childbirth GDG Coordinator
Dr Karen Power	Childbirth GDG Project Manager
Dr Michelle Quinlan	General Practitioner
Dr Jeremy Smith	Lead, Clinical Programme for Anaesthesia
Dr Karen Smith	General Practitioner (until May 2018)
Ms Deirdre Walsh	Clinical Indemnity Scheme, State Claims Agency

Credits

The role of the NCEC is to prioritise, quality assure and recommend clinical guidelines to the Chief Medical Officer for endorsement by the Minister for Health. It is intended through Ministerial endorsement that full implementation of the guideline will occur through the relevant service plans.

The NCEC and the Department of Health acknowledge and recognise the Chair and members of the GDG for development of the guideline. The NCEC and Department of Health express thanks and gratitude to everyone contributing to this National Clinical Guideline, especially those who gave of their time on a voluntary basis.

Acknowledgments

The Chair, Professor Michael Turner, acknowledges the Childbirth Guideline Development Group as contributors to the development of this National Clinical Guideline. All members approved the final clinical guideline. Ms Shelley O'Neill and Dr Barbara Clyne of HRB-CICER carried out the search for evidence, systematic review and budget impact analysis and were extremely supportive throughout the process. Ms Pauline Dempsey was integral to facilitating all links between the NCEC, Clinical Effectiveness Unit and the Childbirth GDG. Dr Karen Power wrote and prepared the final document and submitted the guideline for NCEC quality assurance.

Special thanks to the hospitals and individuals who provided feedback, who piloted the audit tools and IMEWS chart and responded to queries throughout the process. Thanks also to Ms Fiona McDaid, the Deteriorating Patient Recognition and Response Improvement Programme, the National Sepsis Team, Dr Niamh O'Rourke and Ms June Boulger for their assistance and contribution. Thanks to Mochua Print and Design for their seamless and speedy revisions of the IMEWS chart. The external review carried out by Ms Rachel Scanlan, Dr Clare Willocks and Dr Audrey Quinn is acknowledged with gratitude.



Signed by the Chair Professor Michael Turner
February 2019

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Glossary of terms and abbreviations

Clinical Audit – a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit criteria and the implementation of change. Aspects of the structure, processes, and outcomes of care are selected and systematically evaluated against explicit criteria. Where indicated changes are implemented at an individual team, or service level, and further monitoring is used to confirm improvement in healthcare.

Clinical Escalation – describes a process whereby a change in the woman's physiological status or a clinical concern that need not be specified, prompts a team response such that a clinician with appropriate competencies and diagnostic skills attends the woman in an appropriate time-frame and manages the physiological problem or clinical cause for concern.

Clinical Guideline – systematically developed statements to assist practitioner and patient decisions about appropriate healthcare for specific circumstances.

Clinician – a health professional, such as a doctor, midwife or nurse, involved in clinical practice.

Local Governance Group – a multidisciplinary group established to oversee ongoing implementation and evaluation of IMEWS. This group may contain, but is not limited to, obstetric, medical, midwifery, nursing, quality and risk, education or practice development and hospital management representatives.

National Clinical Guidelines – a suite of guidelines that meet specific prioritisation and quality assurance criteria and that have been recommended by the National Clinical Effectiveness Committee. Clinical guidelines endorsed by the Minister will be titled 'National Clinical Guidelines'.

Parameter – limit or boundary which defines the scope of a particular process or activity. For the purposes of IMEWS this refers to the boundaries for vital signs within which the vital sign is normal or triggers yellow or pink.

Senior medical personnel – a medical professional of registrar level or higher.

Track and Trigger – a 'track and trigger' tool refers to an observation chart that is used to record vital signs or observations so that trends can be 'tracked' visually and which incorporates a threshold (a 'trigger' zone) beyond which a standard set of actions is required by health professionals if a patient's observations breach this threshold.

Vital signs – clinical measurements that indicate the state of a patient's essential body functions.

Abbreviations

AVPU	Alert, Voice, Pain, Unresponsive
BIA	Budget Impact Analysis
BIU	Business Information Unit
BP	Blood Pressure
CEO	Chief Executive Officer
CMACE	Centre for Maternal and Child Enquiries
CME	Centre for Midwifery Education
EMEWS	Emergency Medicine Early Warning System
EWS	Early Warning System/Score
FAQ	Frequently Asked Questions
GDG	Guideline Development Group
GRADE	Grading of Recommendations Assessment, Development and Evaluation
HDU	High Dependency Unit
HIQA	Health Information and Quality Authority
HRB-CICER	Health Research Board Collaboration in Ireland for Clinical Effectiveness Reviews
HSE	Health Service Executive
ICT	Information and Communications Technology
ICU	Intensive Care Unit
IMEWS	Irish Maternity Early Warning System
ISBAR	Identity, Situation, Background, Assessment and Recommendation
KPI	Key Performance Indicator
LOS	Length of stay
MDE	Maternal Death Enquiry
MMR	Maternal Mortality Rate
MN-CMS	Maternal and Newborn Clinical Management System
NCEC	National Clinical Effectiveness Committee
NCG	National Clinical Guideline
NEWS	National Early Warning Score
NMBI	Nursing and Midwifery Board of Ireland
NMPDU	Nursing Midwifery Planning and Development Units
NPEC	National Perinatal Epidemiology Centre
NSP	National Service Plan
NWIHP	National Women and Infants Health Programme
ONMSD	Office of the Nursing and Midwifery Services Director
PEWS	Paediatric Early Warning System
QC-M	Quality Care-Metrics
QI	Quality Improvement
SAFE	Situation Awareness for Everyone
SMM	Severe Maternal Morbidity
TYC	Test Your Care
WHO	World Health Organization

1

National Clinical Guideline recommendations

1.1 Summary of recommendations

Measurement and documentation of vital signs

Recommendation 1

The Irish Maternity Early Warning System (IMEWS) should be used for the hospital care of a woman with a confirmed clinical pregnancy and for up to 42 days in the postnatal period irrespective of age or reason for presentation to hospital. Exclusions are women in labour, high dependency, recovery and critical care settings.

Quality of Evidence: ⊕○○○

Strength of Recommendation: **Strong**

Responsible for implementation: **Doctors, Midwives, Nurses and Masters or Hospital Chief Executive Officers (CEO)**

Recommendation 2

IMEWS should be used to complement clinical care and it is not designed to replace clinical judgment. Clinical concern about an individual woman warrants an escalation to medical staff irrespective of the presence or absence of IMEWS triggers. The level and speed of escalation should reflect the degree of clinical concern.

Quality of Evidence: ⊕○○○

Strength of Recommendation: **Strong**

Responsible for implementation: **Doctors, Midwives and Nurses**

Recommendation 3

If a woman or a visitor expresses concern about her wellbeing, this should be listened to carefully as it may reflect the early onset of a critical illness. The woman should have her vital signs checked.

Quality of Evidence: ⊕○○○

Strength of Recommendation: **Strong**

Responsible for implementation: **Doctors, Midwives and Nurses**

Recommendation 4

The standard IMEWS vital signs must be recorded as a baseline on admission. These are: respiratory rate, temperature, maternal heart rate, systolic blood pressure, diastolic blood pressure and neurological response. The subsequent frequency of observations should be determined by the baseline recordings and the woman's individual clinical circumstances.

Quality of Evidence: ⊕○○○

Strength of Recommendation: **Conditional**

Responsible for implementation: **Doctors, Midwives and Nurses**

Recommendation 5

The standard IMEWS vital signs must be completed contemporaneously and recorded for every set of vital signs unless otherwise clinically indicated (See Recommendation 10).

Quality of Evidence: ⊕○○○

Strength of Recommendation: **Strong**

Responsible for implementation: **Doctors, Midwives and Nurses**

Recommendation 6

The technique of measuring, recording and monitoring of vital signs should be undertaken in line with recognised, evidence-based practice.

Quality of Evidence: **No included studies**

Strength of Recommendation: **Strong**

Responsible for implementation: **Doctors, Midwives and Nurses**

Escalation of care and clinical communication

Recommendation 7

The ISBAR (patient deterioration) and ISBAR₃ (clinical handover) communication tools should be used when communicating clinical information. When a situation is deemed to be critical, this must be stated at the outset of the conversation.

Quality of Evidence: **No included studies**

Strength of Recommendation: **Strong**

Responsible for implementation: **Senior Management Team (e.g. Master or CEO, Director of Nursing/Midwifery, Clinical Director), Doctors, Midwives and Nurses**

Recommendation 8

Following clinical review, plans must be put in place and clearly documented as part of the IMEWS response.

Quality of Evidence: ⊕○○○

Strength of Recommendation: **Strong**

Responsible for implementation: **Doctors, Midwives and Nurses**

Recommendation 9

The IMEWS escalation guide should be used to identify the clinical escalation steps and response that should be taken in the event of any IMEWS triggers.

Quality of Evidence: ⊕○○○

Strength of Recommendation: **Strong**

Responsible for implementation: **Doctors, Midwives and Nurses**

Recommendation 10

Variances to IMEWS parameters or the escalation guide may be made by senior medical personnel and should be based on clinical assessment. Parameter changes should be recorded and re-evaluated at a minimum 24 hourly and at each admission.

Quality of Evidence: **No included studies**

Strength of Recommendation: **Conditional**

Responsible for implementation: **Doctors**

Governance

Recommendation 11

The Master or CEO, Clinical Director and Director of Midwifery/Nursing of each hospital and the Chief Executive Officer of the hospital groups are accountable for the local operation of the IMEWS. The HSE NWIHP should ensure that there is a governance structure in place nationally for the implementation and, if necessary, the revision of IMEWS.

Quality of Evidence: **No included studies**

Strength of Recommendation: **Strong**

Responsible for implementation: **Senior Management Team (e.g. Master or CEO, Director of Midwifery/Nursing, Clinical Director) and Doctors, Midwives and Nurses.**

Recommendation 12

A local governance group should oversee the implementation and ongoing review of IMEWS recognition and response systems locally.

Quality of Evidence: **No included studies**

Strength of Recommendation: **Strong**

Responsible for implementation: **Senior Management Team (e.g. Master or CEO, Director of Midwifery/Nursing, Clinical Director) and Doctors, Midwives and Nurses.**

Recommendation 13

A local governance group should identify and support named individuals to oversee local IMEWS implementation.

Quality of Evidence: **No included studies**

Strength of Recommendation: **Strong**

Responsible for implementation: **Senior Management Team (e.g. Master or CEO, Director of Midwifery/Nursing, Clinical Director) and Doctors, Midwives and Nurses.**

Recommendation 14

A local governance group should support additional safety practices (e.g. incorporating briefings, safety pause and huddles) and implementation of relevant guidelines (e.g. NCEC National Clinical Guideline No. 5: Communication (Clinical Handover) in Maternity Services) to enhance the IMEWS and lead to a greater situational awareness among clinicians and multidisciplinary teams.

Quality of Evidence: **No included studies**

Strength of Recommendation: **Conditional**

Responsible for implementation: **Senior Management Team (e.g. Master or CEO, Director of Midwifery/Nursing, Clinical Director) and Doctors, Midwives and Nurses.**

Education, Audit and Evaluation

Recommendation 15

Clinical staff in both maternity and general hospitals should receive education and training in IMEWS. They should know how to call for emergency assistance if they have any concerns about a woman, and know who they should call under these circumstances. This information should be provided at the start of employment and as part of regular refresher education and training.

Quality of Evidence: ⊕○○○

Strength of Recommendation: **Strong**

Responsible for implementation: **Senior Management Team (e.g. Master or CEO, Director of Midwifery/Nursing, Clinical Director) and Doctors, Midwives and Nurses in conjunction with the Hospital Group IMEWS Coordinator (Recommendation 17).**

Recommendation 16

Audit data should be collected and reviewed locally and overseen nationally regarding the implementation and effectiveness of IMEWS.

Quality of Evidence: ⊕○○○

Strength of Recommendation: **Strong**

Responsible for implementation: **The local governance group (Recommendations 12) in consultation with the local IMEWS coordinator (Recommendation 13) and Hospital Group IMEWS coordinator and the NWIHP.**

Recommendation 17

The management of IMEWS (in both maternity and acute hospitals) should be delegated to specifically appointed healthcare professionals in each hospital network. This 'Hospital Group IMEWS Coordinator' should preferably have midwifery experience and job responsibilities should include education and audit for IMEWS.

Quality of Evidence: **No included studies**

Strength of Recommendation: **Strong**

Responsible for implementation: **NWIHP**

Recommendation 18

IMEWS should be supported through the application of quality improvement methods, such as engagement strategies, testing and measurement to ensure successful implementation, sustainability and future progress.

Quality of Evidence: **No included studies**
Strength of Recommendation: **Conditional**
Responsible for implementation: **Local governance group (Recommendation 12), Doctors, Midwives and Nurses**

Summary legend (See Tables 4 and 5 for further information)

Symbol	Quality rating
⊕⊕⊕⊕	High
⊕⊕⊕○	Moderate
⊕⊕○○	Low
⊕○○○	Very low

2

Development of the National Clinical Guideline

2.3 Rationale for this National Clinical Guideline

The physiological changes in pregnancy and the presence antenatally of a second patient, necessitates adjustments to therapeutic and supportive strategies (Neligan and Laffey, 2011). The Irish Maternity Early Warning System (IMEWS) clinical practice guideline was originally developed in 2013 to create an EWS customised for pregnancy to detect critical illness and improve outcomes with early intervention.

Since then, a retrospective before-after study on 81 cases of maternal bacteraemia has shown improvement in the quality and standardisation of observations (Maguire et al., 2015a). Moreover, the IMEWS chart has vital signs and parameters set that are customised for pregnant and postpartum women. This customisation is based on the known physiological changes and results in higher sensitivity and specificity for the detection of illness.

The IMEWS is a multifaceted approach to standardise care, consistency of practice, the improvement of clinical outcomes and the safety of pregnant and postpartum women. It is based upon the implementation of several complementary safety interventions, including the national IMEWS chart and escalation guideline, effective communication using the national standard ISBAR communication tool for patient deterioration, timely midwifery/nursing and medical input, and clear documentation of management plans.

In response to the HIQA Galway Report (2013), the National Clinical Effectiveness Committee (NCEC) was requested by the Minister for Health to commission and quality-assure a number of National Clinical Guidelines (Health Information and Quality Authority, 2013). The IMEWS was one of these guidelines. In collaboration with the HSE Clinical Strategy and Programmes and Quality and Patient Safety divisions the clinical practice guideline IMEWS was developed and in November 2014, was published as NCEC NCG No. 4 IMEWS.

A workshop was held in Dublin in November 2017 for IMEWS users to capture what has worked to date and what needed improvement. Seventy-five delegates attended and eight key themes were identified as requiring attention for this IMEWS update including; education, governance, physiological parameter adjustment, application in the general hospital setting, clinical judgement, chart standardisation, escalation and audit and communication. Overall positive feedback was received in relation the IMEWS chart. Further information can be found in the summary report available on request from the National Women and Infants Health Programme (NWIHP).

A further workshop focussed on IMEWS education and audit was held in collaboration with the Trinity College Dublin School of Nursing and Midwifery on March 8th 2018. Thirty three representatives from sixteen hospitals attended including two acute hospitals: Beaumont Hospital and St Vincent University Hospital. This session was informative in understanding the variability and gaps in both education and audit. These discussions helped inform the revision of IMEWS.

2.4 Aim and objectives

The IMEWS aims to ensure safe, timely, standardised and appropriate hospital monitoring and escalation of clinical care for pregnant and postpartum women (up to 42 days postpartum).

2.5 Guideline scope

This NCG applies to women with a confirmed clinical pregnancy and for up to 42 days in the postnatal period, irrespective of age or reason for presentation. Exclusions are women in labour, high dependency, recovery and critical care settings. This NCG is relevant to all clinical staff in hospitals providing care to those women.

The IMEWS is designed to guide clinical judgement but not replace it. In individual cases a healthcare professional may, after careful consideration, decide not to follow guideline recommendations if it is deemed to be in the best interests of the woman and is in line with best practice. Clinical decisions and therapeutic options should be discussed with a senior clinician on a case-by-case basis as necessary and documented in the clinical notes.

2.6 Conflict of interest statement

The guideline development process followed the conflict of interest policy set out by the NCEC. All members of the Childbirth GDG and the NCEC QA appraisal team were required to complete a Conflict of Interest declaration which was managed by the Project Manager and the CEU respectively. There were no conflicts of interest stated.

2.7 Sources of funding

No external funding was received for this project. The systematic review and budget impact analysis (BIA) was funded by the Department of Health.

2.9 Consultation summary

The Childbirth GDG ensured that all stakeholders had an opportunity to contribute to the development of IMEWS. Three hospitals, Cork University Maternity Hospital, Coombe University Women and Infants Hospital and St Luke's General Hospital Kilkenny, piloted and reviewed the audit tools. All hospitals were invited to review the chart. Those who provided feedback included: University Hospital Galway, University Maternity Hospital Limerick, Wexford General Hospital, Cavan General Hospital and the Clinical Programme for Sepsis.

The final guideline was sent to the following for review and feedback:

- Masters/Clinical Directors, Directors of Midwifery for the 19 maternity hospitals/units
- Chief Directors of Midwifery/Nursing for the six hospital groups
- Designated IMEWS contacts in all 19 maternity hospitals/units
- ONMSD and NMPDU, HSE
- Clinical Programme Anaesthesia
- Clinical Programme Sepsis
- Deteriorating Patient Recognition and Response Improvement Programme

Fourteen of nineteen maternity hospitals/units provided overall feedback on the guideline. Feedback was also received by the ONMSD, NMPDU, members of the Clinical Programme for Sepsis and individual anaesthesiologists (See full list in Appendix 5 in the full guideline). All feedback was reviewed and discussed by the Childbirth GDG in June and September 2018 and amendments were made when agreed by the Group.

2.10 International external review

International external review was completed by three experts in their respective fields of midwifery, obstetrics and anaesthesia:

1. Ms Rachel Scanlan RM MSc, Practice and Standards Professional Advisor, The Royal College of Midwives UK
2. Dr Clare Willocks, Consultant Obstetrician and Gynaecologist, and National Obstetric Lead, Maternity & Children Quality Improvement Collaborative, Healthcare Improvement Scotland
3. Dr Audrey Quinn, Consultant Neuro- and Obstetric Anaesthetist, James Cook University Hospital, Middlesbrough, Honorary Associate Clinical Professor Leeds University

The GDG is very grateful to these reviewers and appreciates the time commitment and expertise that was involved in their review. Reviewers were requested to consider the guideline in accordance with the questions recommended by the National Quality Assurance Criteria for Clinical Guidelines Version 2 (HIQA/NCEC, 2015). The external reviewers were also asked to provide any additional feedback they had. All feedback received was reviewed and incorporated where appropriate. Overall, the external reviewers concluded that this National Clinical Guideline was a major achievement.

The IMEWS patient information leaflet was drafted and proofed in partnership with service users and the National Adult Literacy Association. The IMEWS leaflet was circulated to ten women who had a recent experience of maternity services for their feedback and input. For IMEWS 2.0, minor details including the contact details were updated (See Appendix 11 in the full guideline).

2.11 Implementation

A comprehensive implementation plan for this guideline is outlined in Appendix 7 of the full guideline. The NCEC NCG No. 4 IMEWS V2 should be reviewed by each hospital's senior management team, in conjunction with the relevant local implementation leads and project groups, to appropriately plan implementation of the recommendations. This will ensure that the hospital care of pregnant and postpartum women is optimised.

It is recommended that hospitals use quality improvement (QI) methodology when implementing the IMEWS. Such methods enhance stakeholder engagement and support local adoption through the use of testing, measurement and feedback of key interventions. Recognition must also be given to the complex task of improving patient safety climate (beliefs and attitudes) and culture (actions) that successful implementation of the IMEWS depends upon.

It is recommended that **local governance groups** (Recommendation 12) are established to oversee ongoing implementation and evaluation. This group may contain, but is not limited to, obstetric, medical, midwifery, nursing, quality and risk, education or practice development and hospital management representatives. There should be a designated/named local IMEWS midwife or nurse and consultant doctor coordinator as part of this governance group, to coordinate implementation and evaluation. These coordinators will work alongside the **Hospital Group IMEWS Coordinator** (Recommendation 17) and will report directly to the local governance group. IMEWS coordinators within general hospital settings should have regular communication with their counterparts in the maternity units within their hospital group and with the Hospital Group IMEWS Coordinator.

Some of the potential enablers and barriers for implementation of IMEWS are listed in Table 6. These are similar to NCEC NCG No. 12 PEWS and other international early warning score (EWS) evaluations. This is not an exhaustive list. Local issues should be identified and managed by each hospital/unit.

Table 6. Summary of enablers and barriers to the implementation of IMEWS

Enablers	Barriers
<ul style="list-style-type: none"> • Committed staff at senior level • Good local leadership • Champions • Clearly defined roles and responsibilities • Effective governance • Effective multidisciplinary team work • Effective communication • Complementary safety initiatives such as briefings, huddles and safety pauses • Arrangements in place for the safe and timely transfer of patients to a higher level of care • Ongoing targeted training and reinforcement of learning • Regular audit and evaluation, with the results informing quality improvement plan 	<ul style="list-style-type: none"> • Staff resistant to change • Lack of clearly defined roles and responsibilities • Lack of governance within the organisation • Lack of resources e.g. staff, equipment • Lack of clear, standardised communication • Lack of education, training and resources for staff on IMEWS, and the early detection and management of a pregnant or postpartum woman • Lack of audit and evaluation supports, e.g. Information and communications technology (ICT) and other resources

Barriers to implementation should be identified and addressed by the local governance group as part of organisational quality improvement. Attention to the enablers listed above for implementation planning and strategy may aid the implementation process within that hospital setting.

For full implementation of this guideline, it is essential that *all healthcare professionals* responsible for the care of pregnant and postpartum women understand and appreciate that they are responsible for improving maternity care. This must be supported by clear lines of accountability which include systems that can detect and correct lapses in appropriate care in a timely basis as outlined in this guideline.

Funding for guideline implementation is subject to service planning and estimates process. However, many recommendations in this NCG represent a reiteration of previous good practice and existing IMEWS implementation, and are thus cost-neutral as outlined in the BIA (BIA summary in Appendix 6 Part B, in the full guideline).

Senior Managers responsibilities:

- Provide a local governance structure to support the implementation and ongoing evaluation of the NCEC NCG No. 4 IMEWS V2.
- Assign personnel with responsibility, accountability and autonomy to implement the NCEC NCG No. 4 IMEWS V2.
- Provide managers with support to implement the NCEC NCG No. 4 IMEWS V2 and ensure that clinical staff undertake IMEWS training as appropriate
- Ensure local policies and procedures are in place to support implementation.
- Monitor implementation of the NCEC NCG No. 4 IMEWS V2, support ongoing evaluation and any actions required as a result.
- Link the implementation team/group with corporate governance.

Clinicians responsibilities:

- Comply with the NCEC NCG No. 4 IMEWS V2 and related policies, procedures and protocols.
- Adhere to relevant code of conduct and scope of practice guidelines appropriate to role and responsibilities.
- Maintain competency in the assessment and management of the woman.
- Be aware of the role of appropriate delegation in using the NCEC NCG No. 4 IMEWS V2.

The following tools are provided as supports for implementation:

- An IMEWS e-learning programme is available on HSEland.
- Implementation guidance is in appendix 7 (in the full guideline).
- FAQs and physiological parameter changes in pregnancy overview summary sheet are available in appendix 8.
- Audit and monitoring tools are available in appendix 9.
- Good practice points for the recordings of all vital signs are in appendix 12.
- ISBAR sample communication tools are available in appendix 13 (in the full guideline).
- An IMEWS information leaflet for women is available in appendix 11 and the safety pause information sheet is available in appendix 14 (in the full guideline).

2.12 Monitoring and audit

Monitoring and audit are an important part of the implementation of IMEWS (See Recommendations 16 & 17). *“A ward-based self-assessment audit programme for IMEWS must be introduced in all hospitals with results and findings made available to nursing/midwifery staff”* was a recommendation from an audit of compliance conducted by the Quality and Patient Safety Division in 2014 (Kirwan et al., 2014). See Appendix 9 for the full requirements for monitoring and audit.

National standardised audit will be completed in two ways:

- 1) **IMEWS chart completion** - the audit process for compliance may be coordinated in each maternity unit through the Test Your Care (www.testyourcarehse.com), Nursing and Midwifery Quality Care-Metrics. This is typically required on a monthly basis. The option of *Test Your Care* is available to every Director of Midwifery and Nursing in Ireland. This should be considered to support standardisation, quality care, improvement and sustainability. If this option is not available, sample audit forms are available in Appendix 9.
 - Maternity hospital/units – a monthly minimum of 10 charts per clinical area/ward in your maternity hospital/unit to cover both antenatal and postnatal women.
 - Acute hospitals – an annual minimum of 10 charts or, all charts if less than 10 pregnant or postpartum women present to the hospital.
- 2) **Escalation and Response** - used on women that required escalation of care or/and where there was a requirement for transfers to higher level of care.
 - Maternity hospitals/units – a minimum of 15 episodes per clinical area/ward are completed on a quarterly basis to cover both antenatal and postnatal women.
 - Acute hospitals – an annual minimum of 10 charts or, all charts if less than 10 pregnant or postpartum women present to, or require escalation within the hospital.

Collection of this data is a requirement within the HSE Key Performance Indicator suite for IMEWS. The recommended standard required is 100% compliance (detail available in Appendix 9). Where the compliance is less than 80%, local action plans need to be put in place e.g. increase frequency of audits, training and identification of problem areas.

The local IMEWS Coordinators (Recommendation 13) and the Hospital Group IMEWS Coordinator (Recommendation 17) will hold responsibility for the completion of audits. Feedback should be provided to the local governance group and should be undertaken from a multidisciplinary perspective where appropriate. Results and learning points can be used in the ongoing education delivered by the Hospital Group Coordinator and in the local quality improvement initiatives. The IMEWS chart completion audit tool may be used to promote frontline ownership and may facilitate, for example, learning discussions at handover, ward rounds or education sessions.

Outcome metrics

Measuring outcomes are particularly important to demonstrate the effectiveness or otherwise of the intervention for patients. These include:

- Number of times IMEWS is escalated annually.
- Basic patient outcome measures (e.g. hospital length of stay (LOS), transfer to High Dependency Unit (HDU), Intensive Care Unit (ICU), ICU length of stay, unexpected death).
- Number of cases of serious adverse clinical outcomes when the IMEWS was and was not triggered appropriately.
- Clinical outcomes of adverse outcomes when IMEWS was triggered.

It is anticipated that those units with access to the Maternal and Newborn Clinical Management System (MN-CMS) can collect this data. Once all units have electronic health records, a national data collection system will be considered.

Key Performance Indicators

The Business Information Unit (BIU), HSE, collects and collates the information required to report performance as set out in the National Service Plan (NSP) and operational plans. Two Key Performance Indicators (KPIs) measured since 2014 on IMEWS and reported quarterly are “% of maternity units/hospitals with full implementation of IMEWS” and “% of hospitals with full implementation of IMEWS”. We define implementation for both of these KPIs in Appendix 9 where all criteria need to be met for IMEWS to be considered fully implemented.

2.13 Plan to update this National Clinical Guideline

It was agreed by the Childbirth GDG that the IMEWS guideline should be reviewed on a three-yearly basis and updated in line with NCEC procedures. Therefore, this guideline will be reviewed again in 2022 by the NWIHP.

2.14 Harmonisation of IMEWS and other Early Warning Systems and National Clinical Guidelines

The IMEWS is aligned, where appropriate, to the other National EWS. The NCEC NCG No. 1 National Early Warning System (NEWS) is used for non-pregnant adults including those in gynaecological services. The NCEC NCG No. 12 Paediatric Early Warning System (PEWS) is used for children in paediatric inpatient settings. The NCEC NCG No. 18 Emergency Medicine Early Warning System (EMEWS) is for all adult patients presenting to the emergency department in the post-triage phase until discharge or admission. A diagrammatic explanation for the assignment of and interface between EWSs is outlined in Appendix 15 (in the full guideline).

Governance at individual hospital level should reside with the local governance group that works with IMEWS and other EWS as appropriate. This group may be an “Early Warning Systems” or “Management of the Deteriorating Patient” committee or its equivalent. The hospital’s committee should liaise closely

with its equivalent at Hospital Group level and the National “Deteriorating Patient Recognition and Response Improvement Programme” established by the HSE in 2017.

Other NCEC guidelines that include information relating specifically to pregnancy or postpartum care are the NCEC NCG No 5. Communication (Clinical Handover) in Maternity Services, NCEC NCG No. 6 Sepsis Management and NCEC NCG No 13. Diagnosis, Staging and Treatment of Patients with Gestational Trophoblastic Disease.

All other National Clinical Practice Guidelines from the Clinical Programme for Obstetrics and Gynaecology are in harmonisation with IMEWS and should be adhered to and integrated into practice within each hospital/unit. A list of these practice guidelines is available here: <https://tiny.cc/NWIHP>.

3

National Clinical Guideline Recommendations

3.1 Healthcare questions and evidence statements

Theme 1: Measurement and documentation of vital signs

Healthcare question 1	What early warning systems or trigger systems (including escalation protocols and communication tools such as ISBAR) are currently in use internationally in pregnant women or women who delivered in the previous 42 days, for the detection of deterioration/timely identification of deterioration in maternity patients? What is the level of clinical validation of these scoring systems including escalation protocols, clinical audit and communication tools?
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Evidence statement

Research evidence on clinical effectiveness of maternity early warning systems

Two studies provided effectiveness data. The previous review conducted to support the development of the IMEWS guideline (April 2014) identified one effectiveness study, a before and after study which found the implementation of a Physiological Observation Track and Trigger System (POTTS) in a medium sized maternity unit (approx. 4,000 births per annum) in Ireland was associated with improved observation documentation and a higher level of medical involvement (Daly et al., 2011).

The current review update identified one further study (Shields et al., 2016). This was a controlled before and after study conducted in 29 maternity centres in the USA in patients admitted to the ICU, a high risk population. Maternal morbidity outcomes were compared before and after the introduction of a clinical pathway-specific Maternal Early Warning Trigger (MEWT) tool in six intervention hospitals. Outcomes from the six intervention hospitals were also compared to outcomes in 23 control hospitals in the after phase.

The tool addressed four areas of maternal morbidity: sepsis, cardiopulmonary dysfunction, preeclampsia-hypertension, and haemorrhage. The reported results indicate that severe maternal morbidity (using the Centers for Disease Control and Prevention definition) was significantly reduced (-18.4%, $P=0.01$) when comparing before implementation and after implementation rates. Comparing the six intervention hospitals to the 23 control hospitals (after only) also showed a reduction in severe maternal morbidity ($P<0.01$) after implementation.

As the study identified in the previous review was a conference abstract, quality appraisal could not be performed. The study identified in this update had a high risk of selection bias due to its study design (non-randomised controlled before and after study). Participants and personnel were not blinded in this study resulting in a high risk of performance bias. In relation to how missing study data were handled, the risk of bias was unclear because inadequate information was reported.

The evidence was downgraded to very low quality for this study outcome (maternal morbidity) for the following reasons: study limitations (allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, and other biases), and limited data (one small study, few events for the outcomes, no confidence intervals).

Recommendation 1

The Irish Maternity Early Warning System (IMEWS) should be used for the hospital care of a woman with a confirmed clinical pregnancy and up to 42 days in the postnatal period irrespective of age or reason for presentation to hospital. Exclusions are women in labour, high dependency, recovery and critical care settings.

Quality/level of evidence: ⊕○○○

Strength of recommendation: **Strong**

Responsible for implementation: **Doctors, Midwives, Nurses and Master or Hospital Chief Executive Officer (CEO)**

Good practice point

- The last set of vital signs for women after labour, in high dependency, recovery or critical care settings should be documented on an IMEWS chart and escalated if necessary before transfer to the postnatal ward.

Recommendation 2

IMEWS should be used to complement clinical care and it is not designed to replace clinical judgment. Clinical concern about an individual woman warrants an escalation to medical staff irrespective of the presence or absence of IMEWS triggers. The level of escalation should reflect the degree of clinical concern.

Quality/level of evidence: ⊕○○○

Strength of recommendation: **Strong**

Responsible for implementation: **Doctors, Midwives and Nurses**

Good practice points

- If concerned about a change in a woman clinically, escalate care regardless of triggers.
- All triggers should be added up and documented at the bottom of the IMEWS chart each time vital signs are recorded.
- If the woman scores any yellow or pink scores, the escalation process should be initiated (See Recommendation 9).
- The initials of the person that has completed and recorded the vital signs should be clearly written in the initials box on the IMEWS chart.

Recommendation 3

If the woman or a visitor expresses concern about her wellbeing, this should be listened to carefully as it may reflect the early onset of a critical illness. The woman should have her vital signs checked.

Quality/level of evidence: ⊕○○○

Strength of recommendation: **Strong**

Responsible for implementation: **Doctors, Midwives and Nurses**

Good practice points

- The healthcare professional should never underestimate the concern of the woman or a visitor to the woman.
- Communication between all multidisciplinary team members is essential for the effective interpretation of clinical concern. Healthcare professionals should be familiar with the NCEC NCG No. 5 Communication (Clinical Handover) in Maternity Services.
- Healthcare professionals should use their judgement when determining the level of response required to the concern expressed and act accordingly.

Recommendation 4

The standard IMEWS vital signs must be recorded as a baseline on admission. These are: respiratory rate, temperature, maternal heart rate, systolic blood pressure, diastolic blood pressure and neurological response. The subsequent frequency of observations should be determined by the baseline recordings and the woman's individual clinical circumstances.

Quality/level of evidence: ⊕○○○

Strength of recommendation: **Conditional**

Responsible for implementation: **Doctors, Midwives and Nurses**

Recommendation 5

The standard IMEWS vital signs must be completed contemporaneously and recorded for every set of vital signs unless otherwise clinically indicated (Recommendation 10).

Quality/level of evidence: ⊕○○○

Strength of recommendation: **Strong**

Responsible for implementation: **Doctors, Midwives and Nurses**

Recommendation 6

The technique of measuring, recording and monitoring of vital signs should be undertaken in line with recognised, evidence-based practice.

Quality/level of evidence: **No included studies**

Strength of recommendation: **Strong**

Responsible for implementation: **Doctors, Midwives and Nurses**

Good practice points for Recommendations 4-6

- All standard IMEWS vital signs should be recorded at every set of recordings unless senior medical input has indicated otherwise (Recommendation 10). Always be mindful that having a heightened awareness for one diagnosis does not preclude another. All vital signs are important alongside the clinical context.
- A minimum frequency of observations for women antenatally is 12 hourly. For women postnatally, observations should be taken within 12 hours following arrival on a postnatal ward and then daily as a minimum subsequently. An increase in the frequency of observations may be determined by the doctor.
- Staff should be trained in the correct technique for measuring and recording vital signs.
- If the woman scores any yellow or pink scores, the escalation process should be initiated.
- The IMEWS chart should NOT be used for women in labour, high dependency, recovery and critical care settings. Vital signs for women in labour should be recorded on the partogram or iVIEW for those hospitals/units using the MN-CMS. The first set of observations for each of these areas should be documented on the IMEWS chart and acted on appropriately before transfer to the postnatal ward.
- Please see Appendix 12 for good practice points for the recording of all observations and completing the IMEWS chart

Theme 2: Escalation of care and clinical communication

Healthcare question 1	What early warning systems or trigger systems (including escalation protocols and communication tools such as ISBAR) are currently in use internationally in pregnant women or women who delivered in the previous 42 days, for the detection of deterioration/timely identification of deterioration in maternity patients? What is the level of clinical validation of these scoring systems including escalation protocols, audit and communication tools?
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Evidence statement

There were no included studies in the systematic review as the criteria for inclusion were controlled studies and no controlled studies were found. However, there are many peer reviewed articles citing the positive use of structured communication tools, which have been shown to improve staff members perception of communication, job satisfaction, teamwork and safety climate (Beckett and Kipnis, 2009; De Meester et al., 2013; Randmaa et al., 2014; Ting et al., 2017).

ISBAR is the structured communication tool identified for use in the NCEC NCG No. 5 Communication (Clinical Handover) in the Maternity Services and is recommended by the WHO Collaborating Centre for Patient Safety Solutions (WHO Collaborating Centre for Patient Safety Solutions, 2007). See Appendix 13 (in the full guideline) for the ISBAR tool for patient deterioration and ISBAR₃ for shift handover and inter-department handover.

The NCEC NCG No. 5 cites the following risks associated with clinical handover whether as part of shift or interdepartmental clinical handover or communication of information when escalation of care is required:

- Delay in critical referrals leading to adverse incidents.
- Delay in treatments leading to increased risk of infection and/or exacerbation of infection or illness, which may lead to poor patient outcomes, death or prolonged hospital stays.
- Competence of staff.
- Lack of continuity of care.
- Waste of valuable time when inaccurate and/or incomplete information is provided.
- Inappropriate treatment being provided for patients.

If any of the above risks are present, strategies need to be put in place with timelines to address those risks.

Recommendation 7

The ISBAR (patient deterioration) and ISBAR₃ (clinical handover) communication tools should be used when communicating clinical information. When a situation is deemed to be critical, this must be clearly stated at the outset of the conversation.

Quality/level of evidence: **No included studies**

Strength of recommendation: **Strong**

Responsible for implementation: **Senior Management Team (e.g. Master or CEO, Director of Nursing/Midwifery, Clinical Director), Doctors, Midwives and Nurses.**

Good practice points

- All maternity units should have effective communication systems in place to ensure that there is minimal delay between the triggering of a call for a review and the arrival of a doctor. The designation of who should be called for each trigger (as outlined on the IMEWS escalation guide) should be agreed locally by the senior midwifery and medical management and should be clearly communicated to staff members. The designation may depend on the availability of staff resources.
- Depending on the acute illness, early consideration should be given to seeking professional assistance from other medical specialities such as an anaesthesiologist, haematologist or microbiologist either from within or from outside the maternity unit. Consideration should also be given to contacting neonatology/paediatrics in relation to the baby's wellbeing. Once the patient is clinically stable, it may be necessary to transfer the patient to a HDU or ICU. If this is anticipated, early communications with the HDU/ICU is important. Follow local care pathway for admission.
- Attention should also be paid to staff handovers in all disciplines. This is particularly important at weekends and holidays when staffing levels may be lower than usual.
- A sample ISBAR sticker to communicate escalation of care is available in Appendix 13 (in the full guideline).
- Healthcare professionals should be familiar with the NCEC NCG No. 5 for Communication (Clinical Handover) in Maternity Services.

Recommendation 8

Following clinical review, plans must be put in place and clearly documented as part of the IMEWS response.

Quality/level of evidence: ⊕○○○

Strength of recommendation: **Strong**

Responsible for implementation: **Doctors, Midwives and Nurses**

Good practice points

- Clinicians should consider the woman's comorbidities and individual risk factors in deciding their monitoring plan.
- A minimum frequency of observations for women antenatally is 12 hourly. A minimum frequency for women postnatally is 12 hours after arrival in the postnatal ward and then 24 hourly as a minimum subsequently. An increase in the frequency of observations may be determined by a doctor.
- A minimum frequency of 4-hourly observations applies to all women under review for infection or hypertension. All standard vital signs should be recorded for these observations.
- Local policies and case-by-case clinical decisions on the frequency of monitoring should be adhered to.
- There are existing guidance documents in place to facilitate high quality and standardised documentation including;
 - o HSE, Standards and Recommended Practices for Health Records Management QPSD-D-006-3 V3.0, 2011
 - o Nursing and Midwifery Board of Ireland, Recording Clinical Practice Professional Guidance, 2015

Recommendation 9

The IMEWS escalation guide should be used to identify the clinical escalation steps and response that should be taken in the event of any IMEWS triggers.

Quality/level of evidence: ⊕○○○

Strength of recommendation: **Strong**

Responsible for implementation: **Doctors, Midwives and Nurses**

Good practice points

- If, at any time, there is a new clinical concern, escalate immediately regardless of the IMEWS.
- The escalation guide describes clear pathways for the notification to the midwife/nurse in charge and obstetrician. The IMEWS escalation guide is printed on the front side of the IMEWS chart.
- All local policies for escalation should comply with the IMEWS escalation guide and should outline who to contact and how to contact them. Where escalation occurs based on clinical concern, please follow local escalation guidelines.

Recommendation 10

Variances to IMEWS parameters or the escalation guide may be made by senior medical personnel and should be based on clinical assessment. Parameter changes should be recorded and re-evaluated at a minimum 24 hourly and at each admission.

Quality/level of evidence: **No included studies**

Strength of recommendation: **Conditional**

Responsible for implementation: **Doctors**

Good practice points

- The designation of “senior medical personnel” should be agreed locally by senior management.
- All variations, including clinical rationale, planned review and timings for review, must be clearly documented in the woman’s healthcare record.
- Parameter amendment should be made only for women with known or pre-existing conditions affecting their baseline physiological parameters.

Theme 3: Governance

Evidence statement

Published evidence specific to the governance structures and organisational supports required for the effective implementation of obstetric EWS is limited. However implementation requiring a change of practice requires strong foundations including governance, leadership, staff engagement, education and capability in improvement methodology. These supports generate the planning, motivation and culture change necessary to embed new and complex practices.

The National Standards for Better Safer Maternity Care set out *“Formalized governance arrangements ensure that there are clear lines of accountability at individual, team and service levels. Therefore, healthcare professionals, managerial staff and everyone working in the maternity service are aware of their responsibilities and accountability. There must also be arrangements in place to plan and manage service change and transition effectively and safely”* (p108, Health Information and Quality Authority, 2016).

A suite of ten principles for good clinical governance based on national standards and legislation, for the Irish health context, have been developed by the Quality and Patient Safety Directorate (Figure 1), intended as a guide for the development of clinical governance (Health Service Executive, 2012). These principles should be examined in the context of the clinical governance document.



Figure 1: Guiding principles for clinical governance

Recommendation 11

The Master or CEO, Clinical Director and Director of Midwifery/Nursing of each hospital and the Chief Executive Officer of the hospital groups are accountable for the local operation of the IMEWS. The HSE NWIHP should ensure that there is a governance structure in place nationally for the implementation and, if necessary, the revision of IMEWS.

Quality/level of evidence: **No included studies**

Strength of recommendation: **Strong**

Responsible for implementation: **Senior Management Team (e.g. Master or CEO, Director of Midwifery/Nursing, Clinical Director) and Doctors, Midwives and Nurses.**

Recommendation 12

A local governance group should oversee the implementation and ongoing review of IMEWS recognition and response systems locally.

Quality/level of evidence: **No included studies**

Strength of recommendation: **Strong**

Responsible for implementation: **Senior Management Team (e.g. Master or CEO, Director of Midwifery/Nursing, Clinical Director) and Doctors, Midwives and Nurses.**

Good practice points

- The governance for IMEWS implementation may be incorporated into existing early warning system governance structures, and should
 - o Have appropriate responsibilities delegated and be accountable for its decisions and actions
 - o Monitor the effectiveness of interventions and training
 - o Have a role in reviewing performance data and audits
 - o Provide advice about the allocation of resources
- An Initials/Signature Bank should be maintained in each hospital according to local guidelines.

Recommendation 13

The local governance group should identify and support named individuals to oversee local IMEWS implementation.

Quality/level of evidence: **No included studies**

Strength of recommendation: **Strong**

Responsible for implementation: **Senior Management Team (e.g. Master or CEO, Director of Midwifery/Nursing, Clinical Director) and Doctors, Midwives and Nurses.**

Good practice points

- IMEWS midwifery/nursing and medical consultant leads for each site should be identified
- IMEWS champions should be named at ward level to facilitate questions/queries from colleagues or women and continue to promote compliance with completion of the observation charts and the escalation guide

Recommendation 14

A local governance group should support additional safety practices (e.g. incorporating briefings, safety pause and huddles) and implementation of relevant guidelines (e.g. NCEC National Clinical Guideline No. 5: Communication (Clinical handover) in Maternity Services) to enhance the IMEWS and lead to a greater situational awareness among clinicians and multidisciplinary teams.

Quality/level of evidence: **No included studies**

Strength of recommendation: **Conditional**

Responsible for implementation: **Senior Management Team (e.g. Master or CEO, Director of Midwifery/Nursing, Clinical Director) and Doctors, Midwives and Nurses.**

Good practice points

- The use of huddles/safety pauses may assist with managing an environment where multiple women require simultaneous escalation
- Shared learning and a need for quality improvement capability will be required by all early warning system and safety intervention teams
- Healthcare professionals involved in the use of IMEWS should also be familiar with other relevant clinical practice guidelines for maternity including but not limited to:
 - o Guidelines for the clinically ill woman in obstetrics
 - o Preterm Prelabour Rupture of Membranes
 - o Venous Thromboprophylaxis in Pregnancy
 - o The Management of Hypertension in Pregnancy
 - o Bacterial Infections Specific to Pregnancy
 - o Diagnosis and management of pre-eclampsia and eclampsia

All clinical practice guidelines are available through the NWIHP section of the HSE website <http://tiny.cc/NWIHP>

Theme 4: Education, Audit and Evaluation

Healthcare question 2	What education programmes have been established to train healthcare professionals in the delivery of MEWS? What level of evaluation has been used for these education programmes?
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Evidence statement

This current review did not identify any evaluations of education programmes in the delivery of early warning scores or systems. The previous review found that education and training appeared to assist in improving compliance rates with maternal early warning systems, and that compliance diminished over time (Allman et al., 2010; Helme et al., 2012; Maguire et al., 2015a; O'Connor and Reid, 2010; Ram et al., 2013).

Recommendations from the included clinical audit literature (18 obstetric audits) include education and training for midwifery and obstetric staff (references listed in Annex 1: systematic review). What form this education should take, how often it should be conducted, who should deliver and attend is not clear from the literature.

The original education programme was delivered in 2013/2014 to all healthcare staff. This was shared by the IMEWS development group members that travelled to different sites nationally alongside the Centre for Midwifery Education (CME) in Dublin which used a train-the-trainer model. This was considered a success as all 19 units were capable of effectively implementing IMEWS. However, this model has difficulties in both a lack of national standardisation and uncertainty about who should deliver training. High turnover of staff results in the loss of the training knowledge and robust sustained education and training has diminished over time.

The workshop held in November 2017 on IMEWS strongly highlighted the desire amongst the frontline healthcare staff for dedicated support for both education/training and audit.

Recommendation 15

Clinical staff in both maternity and general hospitals should receive education and training in IMEWS. They should know how to call for emergency assistance if they have any concerns about a woman, and know who they should call under these circumstances. This information should be provided at the start of employment and as part of regular refresher education and training.

Quality/level of evidence: ⊕○○○

Strength of recommendation: **Strong**

Responsible for implementation: **Senior Management Team (e.g. Master or CEO, Director of Midwifery/Nursing, Clinical Director) and Doctors, Midwives and Nurses in conjunction with the Hospital Group IMEWS Coordinator (Recommendation 17).**

Practical guidance for implementation

- Training for the implementation of the IMEWS education programme will be delivered in two ways. The first is an e-learning programme hosted on HSEland (www.hseland.ie) and the second is through local, clinically-based ward training sessions.
- The e-learning module is a 60-minute course that will provide all the required learning points to successfully use the IMEWS chart including formative assessments and a case study. A certificate of completion will be available.
- The clinically-based ward training sessions are a means to continuous ongoing multidisciplinary training in a real-life situation where questions and answers can be facilitated.
- Frequency of the online education programme and ward-based training sessions will at the discretion of the local governance group and hospital management.
- This guideline alongside the supporting tools and e-learning links will be located on the clinical guideline section of the National Women and Infants Health Programme website (<http://tiny.cc/NWIHP>) and at the NCEC, Department of Health (http://tiny.cc/NCEC_NCGs).

Good practice points

- A record of attendance and completion of training for all relevant clinical staff should be maintained locally.
- All healthcare providers using IMEWS should be familiar with relevant guidelines associated with IMEWS that are linked from the e-learning programme but not included in the 60-minute timeframe for training.
- Hospital group midwife/nurse in charge of education and audit for IMEWS should link in with the local IMEWS coordinators to facilitate open communication, organisation and quality improvement requirements.
- All medical, midwifery and nursing staff should be able to:
 - o Systematically assess a patient
 - o Appropriately complete the IMEWS observational chart
 - o Understand and interpret abnormal physiological parameters and other abnormal observations
 - o Initiate appropriate early interventions for patients who are deteriorating
 - o Respond with life-sustaining measures in the event of severe or rapid deterioration pending the arrival of emergency assistance
 - o Communicate information about clinical concern in a structured and effective way to the doctor or team responsible, to clinicians providing emergency assistance and to women, families and carers
 - o Undertake tasks required to properly respond to women who require escalation of care such as developing a clinical management plan, writing plans and actions in the healthcare record and organising appropriate follow up.

Healthcare question 1	What early warning systems or trigger systems (including escalation protocols and communication tools such as ISBAR) are currently in use internationally in pregnant women or women who delivered in the previous 42 days, for the detection of deterioration/timely identification of deterioration in maternity patients? What is the level of clinical validation of these scoring systems including escalation protocols, audit and communication tools?
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Evidence statement

The systematic review did not identify a standard set of criteria for audit. The 18 obstetric clinical audits included in the review highlight that compliance rates with early warning scores and with documentation and escalation policies is often inadequate (references listed in the annex for the systematic review). Routine audit was suggested by a number of included audits as a way of increasing compliance and accuracy. The remaining clinical audits in paediatric, general and emergency department populations reported similar rates of inadequate compliance and also suggested regular audit as a mechanism to increase compliance.

Taking steps to conduct audit at all levels of healthcare are required under the “National Standards for Safer Better Healthcare” (Health Information and Quality Authority, 2012) and supports are outlined in “A Practical Guide to Clinical Audit” (Quality and Patient Safety Directorate, 2013).

Recommendation 16

Audit data should be collected and reviewed locally and overseen nationally regarding the implementation and effectiveness of IMEWS.

Quality/level of evidence: ⊕○○○

Strength of recommendation: **Strong**

Responsible for implementation: **The local hospital management (Recommendation 13) in consultation with the local IMEWS and Hospital Group IMEWS Coordinator (Recommendations 14 and 17) and the NWIHP.**

Good practice points

- Where necessary, IMEWS audits should inform the continuous quality improvement process.
- Audits should span all areas where IMEWS is used.
- Those units using electronic records (MN-CMS) may have the means to collect a further subset of data that should be collated nationally but may be facilitated by the Hospital Group Education and Audit Coordinator (Recommendation 17). These may include:
 - Number of times IMEWS is triggered annually
 - Basic patient outcome measures (e.g. hospital length of stay (LOS), transfer to HDU, ICU, ICU length of stay, unexpected death)
 - Number of cases of serious adverse clinical outcomes when the IMEWS was not triggered
 - Clinical outcomes of adverse outcomes when IMEWS was triggered.

Practical guidance for implementation

- In order to successfully complete the required KPI for the Business Information Unit (BIU)(See Appendix 9). The following audits should be conducted:
 - a) **the chart completion audit** should be undertaken monthly with a minimum of 10 charts per clinical area/ward for your maternity hospital/unit OR 10 charts annually for pregnant or postpartum women in the general hospitals without maternity units
 - b) **the escalation and response audit** should be undertaken quarterly with a minimum of 15 escalation episodes per clinical area/ward for your maternity hospital/unit OR 10 episodes annually for pregnant or postpartum women in the general hospitals without maternity units.
- The recommended standard required for process audits is 100% compliance. Where compliance is <80%, local actions plans should be put in place e.g. increase the frequency of audits, training and identifying problem areas.
- Audit results should be discussed at the local governance group meetings and any other appropriate hospital forum as required.
- A review of the audit tools should be done annually, led by the NWIHP and facilitated by the hospital groups IMEWS Education and Audit Coordinators.

Recommendation 17

The management of IMEWS (in both maternity and acute hospitals) should be delegated to specifically appointed healthcare professionals in each hospital network. This 'Hospital Group IMEWS Coordinator' should preferably have midwifery experience and job responsibilities should include education and audit for IMEWS.

Quality/level of evidence: ⊕○○○

Strength of recommendation: **Strong**

Responsible for implementation: **The National Women and Infants Health Programme (NWIHP)**

Practical guidance for implementation

- Frontline ownership of education, audit and monitoring should be in place to promote good practice, facilitate effectiveness, local improvements, responsibility and ownership. However, group level support facilitates shared learning and joint initiatives for improvement. Group level support will also be helpful to the general hospitals.
- Staff dedicated to IMEWS will allow for clear governance and accountability. The selection of a coordinator is important as successful implementation is reflective of the quality of training provided.

Recommendation 18

IMEWS should be supported through the application of quality improvement methods, such as engagement strategies, testing and measurement to ensure successful implementation, sustainability and future progress.

Quality/level of evidence: **No included studies**

Strength of recommendation: **Conditional**

Responsible for implementation: **Local hospital management (Recommendation 13), Doctors, Midwives and Nurses**

Good practice points

- Quality improvement methodology facilitates successful implementation by:
 - Adapting effective interventions for new contexts
 - Helping to formulate theories of change
 - Identifying, understanding and mobilising stakeholders
 - Providing clarity of goals
 - Breaking down large tasks to key components
 - Using measurement to drive change
 - Testing ways to perform key processes reliably
 - Supporting innovation and frontline ownership.
- Shared learning and a need for quality improvement capability will be required by all early warning system and safety intervention teams.
- Healthcare providers should be familiar with the “Framework for Improving Quality in our Health Service, 2017”.

4

Appendices

Only appendices 8-10 and 12 are presented here as they are key to interpretation of the recommendations in this summary guideline.

Refer to the full guideline report for the remaining appendices:

1. Childbirth GDG terms of reference
2. Search strategy and results
3. Commissioned systematic review summary
4. PICO tables for the healthcare questions
5. Consultation report
6. Economic assessment
 - Part A: Economic evidence summary
 - Part B: Budget impact analysis summary
7. Implementation plan
11. IMEWS information leaflet
13. ISBAR sample tools
14. The Safety Pause
15. The assignment of Early Warning Systems

Appendix 8: FAQs and Physiological Changes in Pregnancy

The supporting tools and e-learning links can be found on the clinical guideline section of the National Women and Infants Health Programme website (<http://tiny.cc/NWIHP>)

Irish Maternity Early Warning System (IMEWS) Frequently Asked Questions (FAQs)

Why do we need IMEWS?

- The IMEWS facilitates a unified approach to maternity care. Women should experience the same standard of care regardless of setting.
- Pregnant women are generally young, healthy and compensate easily for illness. The IMEWS is a supportive tool for *early* detection of deterioration in this population.
- A chart that offers a structured approach to vital sign monitoring will increase safety for staff and women.

Why do we need a different chart for maternity?

- The National Early Warning System (NEWS) is for the non-pregnant adult patient including gynaecology. The physiology of a pregnant and postpartum woman is different to the non-pregnant adult and, therefore, requires a modified early warning system and associated guideline.

Which women does IMEWS apply to?

- All non-labouring women with a clinically confirmed pregnancy and postpartum until 42 days regardless of their presenting condition and regardless of location or age. This includes women presenting to both a maternity unit and a general hospital for a non pregnancy-related condition.

What is the frequency of monitoring vital signs?

- All women should have a full set of vital signs recorded on admission and, therefore, afterwards as clinically required.
- Antenatally - a minimum frequency of 12 hourly.
- Postnatally - observations should be taken within 12 hours following arrival on a postnatal ward and then daily as a minimum.

How do I know to escalate care?

- Always using clinical judgement and experience and if concerned, escalate care regardless of vital signs.
- Any yellow or pink vital signs should trigger a response as per the escalation guide.

How do I escalate care?

- Please refer to the escalation guide on the IMEWS chart.
- Implement measures to reduce triggers if appropriate, inform the midwife in charge, contact the doctor or obstetrician as appropriate and document all communication and management plans in the notes.
- All hospitals should have in place local escalation policies on who to contact and how to contact them. All staff using IMEWS should be familiar with this.

Can we amend the chart locally?

- This is outlined in detail in the good practice points document for IMEWS in Appendix 12 of the IMEWS guideline.
- The pregnancy silhouette can be covered by the addressograph in cases where confidentiality of the pregnancy is requested by the woman.
- Vital sign parameters and frequency of observations should only be amended on a case by case basis by a senior clinician with all changes, reasons for change and review timeline documented in the notes.

What percentage of staff should be trained in using IMEWS?

- All staff using IMEWS should have training completed in order to understand how to complete an IMEWS chart and how to escalate care appropriately.
- New staff (staff in training, those new to the Irish system or returning to practice) should have training provided at the outset of employment.
- Retraining or communication of updates is important in line with updates of the national clinical guideline.
- Audit results will inform the local requirements for retraining.
- Ward-based training is encouraged to mimic real-life circumstances.

Who are the trainers?

- The IMEWS e-learning programme is available online on HSELand.
- Local training should be provided to supplement the e-learning programme.
- Hospital Group IMEWS Coordinators will be appointed to link in with all the hospitals in their group to support ongoing training and audit.

Is there an audit tool?

- Yes, the national audit tools are provided within the National Clinical Guideline. One is for IMEWS chart completion, the second is for reviewing the escalation and response to IMEWS. Appendix 9 in the guideline had a detailed description on monitoring and audit.

Physiological Changes in Pregnancy: Review

Changes in Pregnancy		Notes
Plasma volume	Increased (50%)	To fill vascular bed and maintain blood pressure
Red Blood Cells	Increased (25-30%)	Reduces O ₂ carrying capacity Haemodilution
Cardiac output Heart rate	Increased (40%) Increased 15-20bpm	This increase helped by ↑ heart rate to maintain tissue perfusion and BP because of vasodilation
Vascular resistance	Reduces	Progesterone effects causing vasodilation, Pooling of blood, BP will reduce but increased blood volume reduces impact
Blood Pressure	↓ 2 nd trimester, progesterone effects = vasodilation and reduced peripheral resistance	Important for measuring blood pressure Postural hypotension Physiological changes dangerous if superimposed on existing disease where haemodynamics already compromised
Respiratory Rate	O ₂ consumption increased (20%) due to increasing metabolic needs of mother and foetus	Altered by hormonal and biochemical changes plus the enlarging uterus. Muscles in thoracic region relax, chest broadens, tidal volume improves. Breaths deepen, ligaments between ribs relax increasing rib elasticity. Reduced airway resistance facilitates greater air flow. Increase of 50% in air vol/min. This causes mild respiratory alkalosis – essential for gas exchange across placenta. Progesterone acts as respiratory stimulant. Small degree of breathlessness in pregnancy physiological but after birth unusual. Could be presenting symptom for pulmonary oedema, pulmonary embolism, pneumonia, anaemia. >20 serious
O ₂ saturation	96-98%, rarely 100%	98-99% O ₂ breathed in carried by Hb in blood
Temperature	Progesterone and ↑ basal metabolic rate (BMR) Increase heat generated by 30-35%	Heat loss mechanisms compensate but still increase of about 0.5°C. Increasing temp, increases O ₂ demands and ↑ HR
Urinary system changes	Increase in size in kidneys especially glomerulus. Glomerular filtration rate increases (50%) by end of first trimester Functional capacity of kidneys increase Ureters and renal pelvis dilate Can get backflow of urine from bladder to ureters Pressure effects on bladder tone. Reabsorption by nephron impaired resulting in glycosuria	To cope with increased blood flow. Progesterone effects Increased risk of infections due to pressure effects or pooling Also more likely to retain sodium Altered values and interpretation of blood results

Appendix 9: Monitoring and audit

Regular audit of implementation and impact of this NCEC NCG is recommended to support continuous quality improvement. There are two sections to the required audit;

- 1) **Chart completion.** The audit process for chart completion may be coordinated in each maternity unit through the Test Your Care (www.testyourcarehse.com), Nursing and Midwifery Quality Care-Metrics. This is typically required on a monthly basis. If this option is not available, the sample audit charts below can be used. It is recommended that for either option, acknowledging and monitoring the compliance to documentation is completed as outlined below.

Acknowledging and monitoring compliance

A compliance score can be calculated. The score, expressed as a percentage, is calculated by dividing the number of “yes” answers by the total of “yes” and “no” answers. “Not applicable” answers are excluded from the calculation of the percentage score.

Example: If there are 9 “yes” and 2 “no” answers, the score is calculated as follows:

9 (yes answers) divided by 11 (total of yes and no answers) multiplied by 100.

The score in this example would be **81.8%**

The recommended standard is 100% compliance. Where the compliance is less than 80% it is proposed that local action plans are put in place, e.g. increase frequency of audits and identify problem areas.

Requirement maternity hospital/units - a monthly minimum of 10 charts per clinical area/ward in your maternity hospital/unit to cover both antenatal and postnatal charts.

Requirement acute hospitals – an annual minimum of 10 charts or all charts if less than 10 pregnant or postpartum women present to the hospital.

- 2) **Escalation and Response** - used on women that required escalation of care OR/AND where there was a requirement for transfer to higher level of care.

Requirement maternity hospitals/units - a quarterly minimum of 15 episodes per clinical area/ward are completed on a quarterly basis to cover both antenatal and postnatal episodes.

Requirement acute hospitals – an annual minimum of 10 charts or all charts if less than 10 pregnant or postpartum women present to, or require escalation within the hospital.

The local and hospital group IMEWS coordinators will facilitate the completion of both the ‘chart completion’ and ‘escalation/response’ audits. Feedback should be provided to the local governance group and should be undertaken from a multidisciplinary perspective where appropriate. Results and learning points can be used in the ongoing education delivered by the Coordinator and in the local quality improvement initiatives. The chart completion audit tool may be used up to daily in a clinical area to promote frontline ownership and may facilitate learning discussions at handover, ward rounds or education sessions for example.

IMEWS Chart - Completion			1. Complete this datasheet 2. Determine areas for improvement 3. Take appropriate actions 4. Share the learning 5. Repeat		*Not applicable for MN-CMS		
Section	No.	Element	Record	(Yes, No, n/a)	Section comments:		
1. DOCUMENTATION STANDARDS	1	The addressograph (or details) are recorded on both sides of the chart*					
	2	The booking blood pressure, gestation at booking, booking BMI and large BP cuff are recorded					
	3	Date and time of the observations are recorded					
	4	Time is recorded using the 24 hour clock					
	5	Each entry is initiated					
2. PARAMETERS	6	Respiratory rate is recorded numerically					
	7	Respiratory rate is recorded in the appropriate box*					
	8	SpO2 (if applicable) is recorded numerically					
	9	SpO2 (if applicable) is recorded in the appropriate box*					
	10	Temperature is recorded numerically					
	11	Temperature is recorded in the appropriate box*					
	12	Maternal Heart Rate is recorded numerically					
	13	Maternal Heart Rate is recorded in appropriate box*					
	14	Systolic Blood Pressure is recorded numerically					
	15	Systolic Blood Pressure is recorded in the appropriate box*					
	16	Diastolic Blood Pressure is recorded numerically					
	17	Diastolic Blood Pressure is recorded in the appropriate box*					
	18	Urinalysis is recorded					
	19	Pain score is recorded					
	20	AVPU is recorded					
	3. SCORING	21	Total Yellow Zone is correct on every entry*				
		22	Total Pink Zone is correct on every entry*				
4. SUMMARY							

Audit for month _____ Chart number (out of 10) _____ Antenatal/Postnatal _____ Completed by _____ Date _____

IMEWS Chart - Escalation & Response		Audit for months _____ Date _____														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Please tick ✓ for yes, X for no or n/a is not applicable Care escalated without IMEWS trigger?															
2	A full set of observations were completed within the required timeframe															
3	Midwife in charge informed															
4	There is evidence that the care was escalated to the appropriate level as per escalation guide															
5	Medical review was received															
6	The ISBAR tool was used to document the escalation of care															
7	There is evidence of an increase in the frequency of monitoring and recording of vital signs in response to the detection of observations in the yellow or red zones															
8	Measures implemented to reduce triggers as appropriate															
9	Any variances to the parameters are documented with clear management plans															
10	Medical review documented by the doctor															
11	Plan of care documented by the doctor															
12	Date and time of review documented by the doctor															

Comments:**Action required:**

Completed by: _____

Key Performance Indicators (KPI)

The Business Information Unit collects quarterly KPI data on the IMEWS set out as

- 1) “% of maternity hospitals/units with implementation of IMEWS”
- 2) “% of hospitals with implementation of IMEWS” for the acute hospitals.

Implementation is now defined as follows and is adapted from the NCEC NCG No. 12 PEWS.

DEFINITION OF IMPLEMENTATION 2019 – Maternity Hospitals/Units		
IMEWS is considered implemented if each unit/hospital can state yes to <u>all</u> of the following criteria		
Criteria no.	Criteria	
1	Is there a local Governance Group in place and meetings held on a quarterly basis to review IMEWS implementation and audit data?	
2	Is there a named local coordinator for IMEWS?	
3	Is there a named local consultant lead for IMEWS?	
4	Are IMEWS training records maintained locally?	
5	Is there an ongoing IMEWS clinically-based training programme in place for relevant clinical staff in the hospital?	
6	Excluding women in labour, high dependency, recovery and critical care, are all pregnant and postpartum women monitored using IMEWS?	
7	Is the national IMEWS audit tool on completion utilised at least monthly with a minimum of 10 charts per clinical area/ward in your maternity hospital/unit?	
8	Is the national IMEWS audit tool on escalation and response utilised at least quarterly with a minimum of 15 episodes per clinical area/ward for your maternity hospital/unit?	
9	Is there evidence that if an issue is identified following audit, appropriate quality improvement plans are recorded and actioned?	
10	Has the data submitted in this report been reviewed by the Chair of the local Governance Group?	

DEFINITION OF IMPLEMENTATION 2019 – Acute Hospitals		
IMEWS is considered implemented if each unit/hospital can state yes to <u>all</u> of the following criteria		
Criteria no.	Criteria	
1	Is there a local Governance Group in place and meetings held on a quarterly basis to review IMEWS implementation and audit data?	
2	Is there a named local coordinator for IMEWS?	
3	Is there a named local consultant lead for IMEWS?	
4	Are IMEWS training records maintained locally?	
5	Excluding women in labour, high dependency, recovery and critical care, are all pregnant and postpartum women monitored using IMEWS?	
6	Are the national IMEWS audit tools on completion and on escalation and response utilised annually (at a minimum) on 10 charts for pregnant or postpartum women?	
7	Is there evidence that if an issue is identified following audit, appropriate quality improvement plans are recorded and actioned?	
8	Has the data submitted in this report been reviewed by the Chair of the local Governance Group?	

Appendix 10: IMEWS chart V2.0

Chart correct at time of publication.

**NATIONAL
CLINICAL
EFFECTIVENESS
COMMITTEE**

Hospital Name:

Ward:

Woman's Name:

Date of Birth:

Healthcare Record No:

Addressograph

Irish Maternity Early Warning System (IMEWS)

Escalation Guide

Chart A | Version 2.0

IMPORTANT

- If concerned about a woman, escalate care regardless of vital signs.
- Complete a full set of vital signs and record on the IMEWS chart.
- Communicate any triggers to the midwife/nurse in charge.
- Implement the clinical management plans without delay.
- Document the management plan and communication details in the clinical notes.
- Any changes in the standard recording of the vital signs should be written by the doctor in the clinical records.

1 YELLOW

Repeat full set of observations on IMEWS after 30 and before 60 minutes.

2 YELLOWS
OR 1 PINK

Call the obstetrician to review.
Repeat a full set of observations after 30 minutes.

>2 YELLOWS
OR >1 PINK

Call the obstetrician and request immediate review.
Repeat a full set of observations within 15 minutes or monitor continuously.

The ISBAR communication tool should be used when communicating information in relation to deteriorating and/or critically ill women.

ISBAR

Communication Tool

I

Identify – Yourself, the recipient, the woman

S

Situation – Why are you calling? IMEWS triggers? Clinical Concern?

B

Background – What is the relevant background?

A

Assessment – What do you think is the problem?

R

Recommendation – What do you want them to do?

IMEWS is a National Clinical Guideline and is available through the website of the Department of Health



Woman's Name:

Date of Birth:

Healthcare Record No:

*Addressograph*Document Number
(eg. 1, 2):

Booking BMI:

Booking BP:

Date of
Admission:

DD/MM/YY

Gestation at
Booking (weeks):Large BP Cuff
(Y/N):Contact appropriate doctor for early intervention if the woman triggers one **PINK** or two **YELLOW** zones at any one time

Resp. Rate per min	Date :																	
	Time :																	
	≥25																	≥25
	20-24																	20-24
SpO ₂ only if Resp. Rate Triggers	11-19																	11-19
	≤10																	≤10
	96-100%																	96-100%
	≤95%																	≤95%
Temp °C	≥38.0																	≥38.0
	37.5-37.9																	37.5-37.9
	36.0-37.4																	36.0-37.4
	35.1-35.9																	35.1-35.9
	≤35.0																	≤35.0
Maternal Heart Rate	120																	120
	110																	110
	100																	100
	90																	90
	80																	80
	70																	70
	60																	60
	50																	50
Systolic Blood Pressure	170																	170
	160																	160
	150																	150
	140																	140
	130																	130
	120																	120
	110																	110
	100																	100
	90																	90
	80																	80
	70																	70
Diastolic Blood Pressure	110																	110
	100																	100
	90																	90
	80																	80
	70																	70
	60																	60
	50																	50
	40																	40
Urine	Protein																	Protein
	Glucose																	Glucose
	Other																	Other
Pain Score 0-10																		Pain Score
AVPU Neuro Response	Alert (A)																	A
	Voice (V)																	V
	Pain (P)																	P
	Unresponsive (U)																	U
Total Yellow Zones																		Total yellow zones
Total Pink Zones																		Total pink zones
Initials																		Initials

Appendix 12: Vital sign recordings – good practice points

Information on using IMEWS

The IMEWS observation chart is purple and contains a pregnancy silhouette to distinguish the chart from the NEWS, PEWS and EMEWS.

- Recordings should be made numerically and not with dots.
- Recordings should be made within the appropriate boxes and not across multiple boxes
- Lines may be drawn between systolic and diastolic measurements
- Lines or graphing should not be drawn across the chart except where senior medical personnel have instructed that the clinical condition indicates certain observations can be omitted. In this case, lines can be drawn through those omissions to aid with auditing.
- Respiratory rate, temperature, maternal heart rate, systolic blood pressure, diastolic blood pressure and AVPU neurological response are all 'standard' vital signs to be completed at each set of observations. SpO₂, urine and pain score are 'additional' observations. These are discussed below in the order they appear on the chart.

Respiratory Rate (Standard)

An assessment of respiration should be carried out for 60 seconds following the assessment of heart rate, as making the woman aware of counting her respirations will cause her to be conscious of her breathing and lead to a false reading. If the wrist is supported across the woman's chest, it is possible to count the pulse and then to either feel the rise and fall of the chest, or observe it, counting respirations. Factors such as sound, depth and regularity are observed at the same time.

If respirations are regular, the rate is counted for 30 seconds and doubled. If any abnormalities are detected, respiration is counted for a whole minute (Johnson and Taylor, 2016).

The rate should be documented as a numerical value in the appropriate box e.g. respiratory rate of 16 per minute should be documented numerically in the white box allocated to a respiratory rate of 11-19. Likewise, a respiratory rate of 20 should be documented numerically in the yellow box allocated to respiratory rate of 20-24.

The accepted normal parameters for respiration rate on IMEWS are 11-19 respirations/min.

Oxygen Saturation (Additional)

Oxygen saturation levels are not routinely measured on all women, and only measured in the following circumstances:

- If the respiration rate is outside the normal parameters and within the 'trigger' pink or yellow values
- If a medical/obstetric condition necessitates measurement of oxygen saturation levels e.g. respiratory disorder, High Dependency Care.

Accuracy of the measurement depends on an adequate flow of blood through the light probe i.e. if peripheral circulation has shut down and a woman is in a critical condition, the SpO₂ result may be inaccurate or unobtainable.

Dark nail polish can significantly affect the accuracy of results (Desalu et al., 2013).

The SpO₂ should be documented as a percentage in the appropriate box i.e. SpO₂ of 94% should be documented numerically in the pink box allocated to SpO₂ readings of ≤95%. Likewise the SpO₂ of 96% should be documented numerically in the white box allocated to 96-100%.

The accepted normal parameters for SpO₂ on IMEWS are 96-100%.

Temperature (Standard)

Temperature should be recorded at the appropriate site (i.e. oral, axilla, tympanic) according to local guidelines, ensuring correct use of the appropriate thermometer and equipment.

The recorded temperature should be documented numerically in the appropriate box. Therefore, the temperature of 35.8°C should be documented numerically in the yellow box allocated to 35.1-35.9°. Likewise 38.1 °C should be documented numerically in the pink box allocated to ≥38°C.

Hypothermia is a significant finding that may indicate infection and should not be ignored. Pyrexia may be masked if antipyretics have been administered.

There should be a high index of suspicion for sepsis if infection is a concern. Follow the latest sepsis NCG (<https://health.gov.ie/national-patient-safety-office/ncec/national-clinical-guidelines/clinical-handover/>) and maternal sepsis screening form available from the HSE website (<https://www.hse.ie/eng/about/who/cspd/ncps/sepsis/resources/>).

The accepted normal temperature parameters on IMEWS are 36.0-37.4° C.

Heart Rate (Standard)

The radial artery should be palpated using the index and middle finger, supporting the woman's wrist across her chest, and the rate counted for 30 seconds and doubled if the rate is regular, or sixty seconds if irregular (Kozier, 1998).

Pulse oximeters also give a heart rate reading. However, if the woman has a bradycardia or tachycardia detected electronically, the pulse should be assessed manually for recording rate, rhythm and strength.

Persistent tachycardia over 100 bpm is an important sign that may indicate serious underlying disease and warrants investigation.

The heart rate should be documented numerically on the IMEWS in the appropriate box i.e. heart rate of 86 bpm should be documented into the white box area allocated to 80-89 bpm. A heart rate of 102 bpm should be documented numerically in the yellow box allocated to 100-109 bpm.

The accepted normal heart rate parameters on IMEWS are 60-99bpm

Blood Pressure (Standard)

Blood Pressure is recorded at booking and should be filled out at the top of all IMEWS charts. If a woman is admitted to hospital prior to booking, her blood pressure on admission can be considered her booking BP.

Systolic and diastolic blood pressure, are recorded separately to facilitate the appropriate triggers to be assigned to two separate results from one recording.

Blood pressure must be measured using the correct cuff size, and the size of the cuff used should be documented in the woman's notes.

The mid-arm circumference (MAC) should be measured in all pregnant women particularly those with BMI > 29.9kg/m₂ at their first antenatal visit. If the MAC is > 33 cms, a large cuff should be used for BP measurements subsequently (Health Service Executive et al., 2013). The mid-arm point is determined by measuring the length of the upper arm from the shoulder joint to the antecubital fossa. The mid arm point is taken as the point halfway between these two landmarks (Hogan et al., 2011).

Systolic blood pressure should be documented at Korotkoff I or first clear sound, and the diastolic blood pressure at Korotkoff V, when sounds are no longer audible.

Electronic recording of blood pressure can underestimate readings. It is recommended good practice that if a blood pressure is raised with an electronic reading, the BP should be rechecked manually at least once using an aneroid sphygmomanometer.

Findings should be documented as a numerical value in the appropriate box i.e. systolic blood pressure of 156mmHg is written into the yellow box representing 150-159mmHg. The diastolic reading of 86mmHg should be documented numerically in the white box allocated to 80-89mmHg.

A straight or dotted line between the systolic and diastolic numbers should be used to display a graphic trend.

Hypotension is a late sign of deterioration as it signifies decompensation. The physiological changes caused by pregnancy and childbirth can mean that early signs of impending collapse are not easily recognised.

Hypertension: The conventional definition of hypertension in pregnancy is:

- Two readings of 140/90 mmHg taken at least 4 hours apart, (National Collaborating Centre for Women's and Children's Health (UK), 2010) or
- An increase of 15 mm/Hg above the blood pressure at the first antenatal visit, or
- One reading of 160/100 mmHg or greater.

*The acceptable parameters for systolic blood pressure on IMEWS are 100-139mmHg.
The acceptable parameters for diastolic blood pressure on IMEWS are 50-89mmHg
i.e. 100/50mmHg to 139/89mmHg.*

Urine (Additional after admission)

Urinalysis is required on admission. Thereafter, the frequency of urinalysis following admission depends on the clinical assessment, diagnosis and care plan for the woman.

Urinalysis of freshly voided urine should be undertaken for the purpose of screening, diagnosis or assessment of management and documented on the IMEWS on the following occasions:

- On admission to the hospital for any reason as a baseline observation
- Specific maternal disorders or treatment, e.g. hypertensive disease, diabetes
- Clinical symptoms, e.g. dysuria.

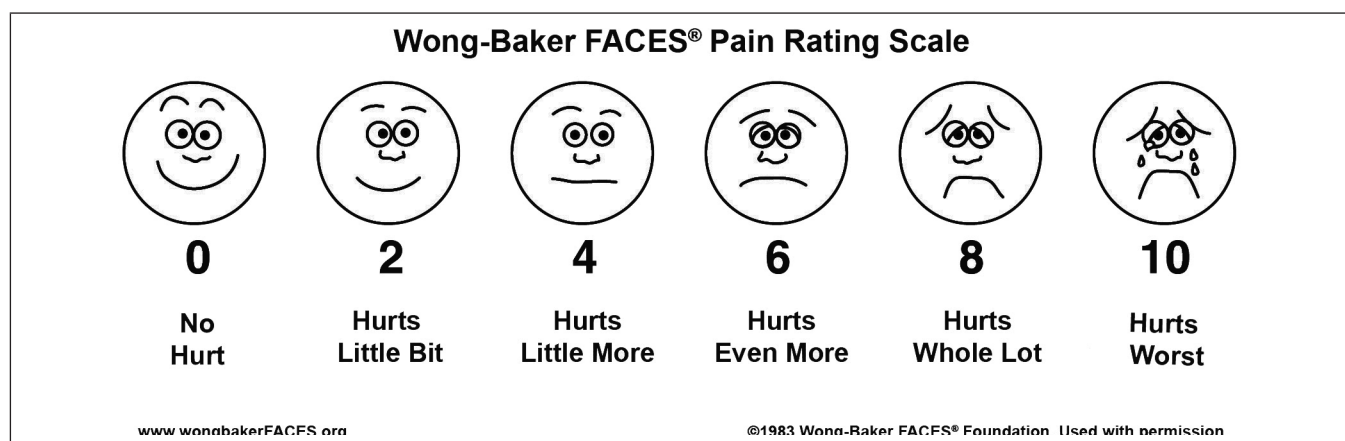
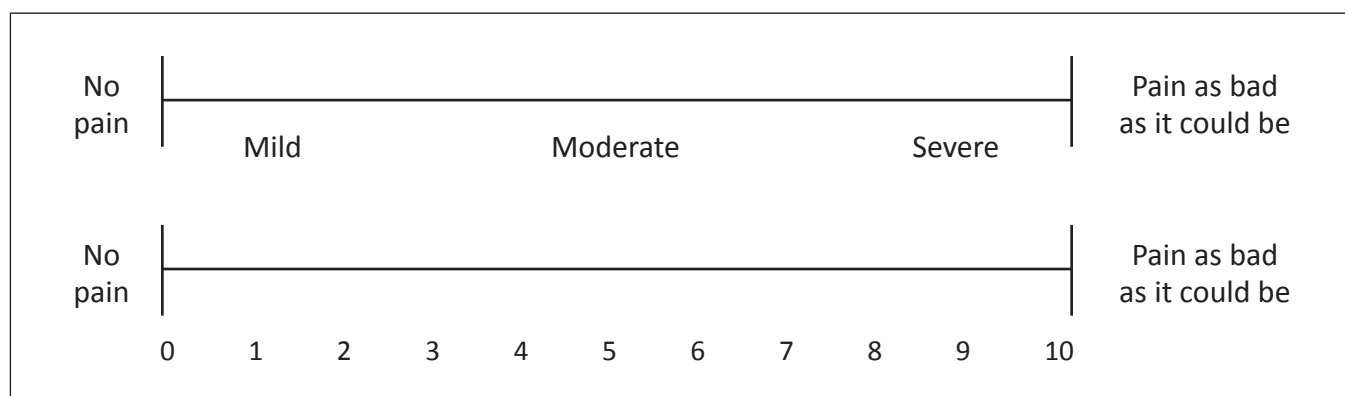
The frequency of urinalysis following admission depends on the clinical assessment and diagnosis of the woman i.e.

- An antenatal woman admitted with hypertensive disease or urinary tract infection may require a minimum of daily urinalysis or more frequently if her clinical condition deteriorates
- However, an antenatal or postnatal woman without risk factors may not require daily urinalysis.

All urinalysis findings should be documented as they appear on the dipstick or urinalysis machine printout e.g., neg, trace, +, ++, +++, +++++.

Pain Score (Additional)

Women should be asked to score their pain on a scale of 0-10 (0: No pain, 10: extreme pain) when a full set of vital signs are being recorded on IMEWS. The following tools may also be used:



Assessment of neurological response (AVPU) (Standard)

Any fall in the level of consciousness (AVPU scale) should always be considered significant and acted on immediately.

A neurological response is a measure of consciousness and the best response of the following should be measured and documented on all women using the AVPU scale, indicating

A – Alert and orientated to person, place, time and event.

V – Responds to voice/verbal stimuli (e.g. post operative recovery).

P – Responds to painful stimuli with a purposeful or non-purposeful movement.

U – Unresponsive - The woman does not respond to any stimuli.

The neurological response assessment should be documented in the appropriate box:

Alert (A): white box (acceptable neurological response parameter)

Responds to Voice (V): Pink box

Responds to Pain (P): Pink box

Unresponsive (U): Pink box.

How to complete the paper IMEWS chart

- 1) Place an addressograph on both sides of the chart
- 2) Complete the Document number, Booking BP, Gestation, Booking BMI, Date of admission and Cuff Size at the beginning of all new charts
- 3) Date, time and initial all entries
- 4) Complete the vital signs contemporaneously
- 5) Enter the individual observation score into the appropriate section using numbers (not dots).
[Use a straight vertical line through vital signs not currently being monitored if there has been a change in the requested recordings as indicated and documented by a senior medical staff member e.g. higher frequency of BP recordings due to hypertensive disorders. Any variances should be documented with clear management plans including a timeline for review (Recommendation 10)].
- 6) Calculate the total number of yellow and pink triggers and record them at the bottom of the IMEWS chart
- 7) Escalate/Review as appropriate. Use the escalation guide as a prompt, the total score and clinical judgement are used to determine the appropriate response to the clinical findings including need for immediate intervention, level of escalation required and appropriate timeframe for reassessment.

Permitted variations to the IMEWS chart

- The local hospital logo may be added to the top left hand corner of the escalation page
- Local variations on the escalation procedure for;
 - a. Who to call in cases of a trigger(s) or clinical concern
 - b. An appropriate bleep/telephone number
- The silhouette can be covered by the addressograph in cases of required confidentiality. This would apply in particular to the acute hospitals.
- Additions to the vital signs currently monitored may be made once they do not impact, remove or replace the existing vital signs.

How to complete the IMEWS in MN-CMS

1. With the patient record open on the page at the top of the left menu, select iView (fourth banner down) with one left click.
2. Once the iView is open, documentation of vital signs can be recorded in the Basic Observations and iView banner. Double click this blue banner bar.

3. Enter the respiration rate, SpO₂, temperature, peripheral pulse rate, systolic blood pressure, diastolic blood pressure, pain score and neurological response. These all need to be entered to calculate an IMEWS total.
4. When all the details have been entered, click 'sign' and a black tick mark will display next to the section to indicate the data has been added to the record.
5. If the observations trigger an escalation, the user will be notified with a discern notification and will be instructed to follow the IMEWS guidelines for the appropriate response.
6. Depending on the severity of the trigger, the chart will turn the vital sign that triggered a different colour. This will enable other staff to easily notice the trigger.
7. There will be no automatic reminder for staff to recheck the triggers within the designated time-frame; they must remember that they need to do this.
8. All triggers that occur for each woman will be seen on the wards Maternity Whiteboard under the IMEWS tab. These triggers will stay visible until they are acted on and removed by the clinician looking after the woman.



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