GRADE Evidence to decision (EtD) framework

Supporting document for the **NCEC National Clinical Guideline No. 4 IMEWS V2**

Prepared by the Childbirth Guideline Development Group during 2018.

Evidence tables

Evidence Table 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 include women in labour, high dependency, recovery and critical care settings.

Quality of the evidence	○ No included studies ● Very low ○ Low ○ Moderate ○ High
Strength of recommendation	Strong

	Criteria	Judgements	Research evidence	Additional considerations
Problem	**Is there a problem priority?**	○ No ○ Probably no ○ Uncertain ○ Probably yes ● Yes ○ Varies	The Confidential Maternal Deaths Enquiry published in 2017 confirmed that Ireland continues to have a low maternal mortality ratio by international standards. In comparison with mortality, severe maternal morbidity is more common with figures from the United Kingdom (UK) indicating that for every maternal death, nine mothers develop severe obstetric complications, including sepsis, massive haemorrhage, hypertensive disorder sequelae, and venothrombotic events. In a study of severe maternal morbidity for 2004/5 in the three Dublin maternity hospitals, the rate of severe maternal morbidity was 3.2 per 1,000 maternities. The most common cause was haemorrhage. Many cases of major maternal morbidity and mortality may be preventable, therefore, early	The report into the circumstances pertaining to the death of Mrs Tania McCabe and her infant son Zach at Our Lady of Lourdes Hospital, Drogheda on Friday 9 March 2007, the Confidential Enquiries into Maternal Deaths UK (CEMACH 2007, CMACE 2011) and the Galway HIQA and HSE report all recommend a national obstetric early warning track and trigger system (Centre for Maternal and Child Enquiries (CMACE), 2011; Health Information

<table>
<tr><th></th><th>Criteria</th><th>Judgements</th><th>Research evidence</th><th>Additional considerations</th></tr>
<tr><td></td><td></td><td></td><td>recognition of clinically deteriorating pregnant women remains a priority for improving maternity services.</td><td>and Quality Authority, 2013; Health Service Executive, 2013, 2008; Lewis (ed), 2007).</td></tr>
<tr><td rowspan="2">Benefits & harms of the options</td><td>What is the overall certainty of this evidence?</td><td>○ No included studies
● Very low
○ Low
○ Moderate
○ High</td><td rowspan="2">The relative importance or values of the main outcomes of interest:
<table><tr><th>Outcome</th><th>Relative importance</th><th>Certainty of the evidence (GRADE)</th></tr><tr><td>Maternal morbidity</td><td>CRITICAL</td><td>⊕◯◯◯
VERY LOW</td></tr></table>
Summary of findings: Clinical effectiveness of early warning or track and trigger systems on pregnancy, labour and birth, postpartum (up to 42 days) and neonatal outcomes
<table><tr><th>Outcome</th><th>Without early warning system</th><th>With early warning system</th><th>Relative effect (RR) (95% CI)</th></tr><tr><td>Maternal</td><td>24 per</td><td>0 per</td><td>Not</td></tr></table></td><td rowspan="2">The delivery of a consistent and standardised service with minimum variation to all women in Ireland is one of the main objectives. This outweighs the alternative of all women being provided different care.

It is unclear if the differences in outcomes pre and post IMEWS implementation but there is no anticipated harm with its introduction.

Considering the heavy emphasis on maintaining clinical judgment, the overall benefits of standardised care enforcing regular vital sign checks for all women in maternity care outweighs any potential harm.</td></tr>
<tr><td>Is there important uncertainty about how much people value the main outcomes?</td><td>○ Important uncertainty or variability
○ Possibly important uncertainty or variability
● Probably no important uncertainty of variability
○ No important uncertainty of</td></tr>
</table>

<table>
<tr><th></th><th>Criteria</th><th>Judgements</th><th>Research evidence</th><th>Additional considerations</th></tr>
<tr><td></td><td></td><td>variability
O No known undesirable</td><td rowspan="4"><table>
<tr><td>morbidity</td><td>1000</td><td>1000</td><td>estimable</td></tr>
<tr><td>Mortality</td><td>No studies</td><td>No studies</td><td>No studies</td></tr>
<tr><td>ICU admission</td><td>No studies</td><td>No studies</td><td>No studies</td></tr>
<tr><td>Length of hospital stay</td><td>No studies</td><td>No studies</td><td>No studies</td></tr>
</table></td><td rowspan="4"></td></tr>
<tr><td>Are the desirable anticipated effects large?</td><td>O No
O Probably no
● Uncertain
O Probably yes
O Yes
O Varies</td></tr>
<tr><td>Are the undesirable anticipated effects small?</td><td>O No
O Probably no
● Uncertain
O Probably yes
O Yes
O Varies</td></tr>
<tr><td>Are the desirable effects large relative to undesirable</td><td>O No
O Probably no
● Uncertain
O Probably</td></tr>
</table>

	Criteria	Judgements	Research evidence	Additional considerations
	effects?	yes O Yes O Varies		
Resource use	**Are the resources required small?**	O No O Probably no ● Uncertain O Probably yes O Yes O Varies	One conference abstract provided cost-effectiveness data which found that the use of a maternal early warning trigger tool reduced severe maternal morbidity which resulted in significant cost savings.	The IMEWS is currently in use in all 19 maternity units. There is variation within the general hospital settings. Therefore the main resource requirements are regarding implementation and in particular, ongoing education and training programmes.
	Is the incremental cost small relative to the net benefits?	O No O Probably no O Uncertain O Probably yes O Yes O Varies	Overall the budget impact is estimated between €2.5-5.2 million which is small relative to the significant morbidity and potential mortality that may be avoided with early warning systems.	
Equity	**What would be the impact on health inequities?**	O Increased O Probably increased	No research evidence was found about the impact of recommending early warning systems on equity.	One of the main objectives of the IMEWS is to provide a standardised and consistent approach to a physiological track and trigger system

	Criteria	Judgements	Research evidence	Additional considerations
		○ Uncertain ○ Probably reduced ● Reduced ○ Varies		instead of all units using their own local system. The IMEWS undoubtedly removes the inequity of this alternative.
Acceptability	**Is the option acceptable to key stakeholders?**	○ No ○ Probably no ○ Uncertain ● Probably yes ○ Yes ○ Varies	A national clinical audit of compliance with the IMEWS Clinical Practice Guideline in selected Irish maternity hospitals/units, found that six out of seven hospitals sampled were using the IMEWS at the time of the audit (May – November 2014). Within the six hospitals using IMEWS, the clinical audit concluded that compliance with vital signs recording was good and the majority of hospitals demonstrated a high level of compliance in relation to escalating the necessary clinical care in cases of red and multiple yellow triggers. However, compliance in relation to the consistent completion of accurate scores when taking sets of observations needed improvement.	An IMEWS day held November 2017 with an attendance of 75 stakeholders all gave positive feedback on the IMEWS chart. While there were changes suggested, no one expressed any uncertainty about the concept of the IMEWS.
Feasibility	**Is the option feasible to implement?**	○ No ○ Probably no ○ Uncertain ○ Probably yes ● Yes ○ Varies	A national clinical audit of compliance with the IMEWS Clinical Practice Guideline in selected Irish maternity hospitals/units, found that six out of seven hospitals sampled were using the IMEWS at the time of the audit (May – November 2014).	From November 2014 all maternity units were using the National IMEWS chart but there is variation in implementation in the general hospital setting. The main implementation hurdle is the provision of ongoing education and training package which should be

	Criteria	Judgements	Research evidence	Additional considerations
				feasible to provide.

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 escalation and a call to medical staff irrespective of the presence or absence of IMEWS triggers. The level of escalation should reflect the degree of clinical concern.

Quality of the evidence	○ No included studies ● Very low ○ Low ○ Moderate ○ High
Strength of recommendation	Strong

	Criteria	Judgements	Research evidence	Additional considerations
Problem	**Is there a problem priority?**	○ No ○ Probably no ○ Uncertain ○ Probably yes ● Yes		In order to continue to preserve the essence of clinical practice, to optimise outcomes and to deliver women-centred care, this recommendation should be considered a priority.

<table>
<tr><th></th><th>Criteria</th><th>Judgements</th><th>Research evidence</th><th>Additional considerations</th></tr>
<tr><td></td><td></td><td>○ Varies</td><td></td><td></td></tr>
<tr><td rowspan="2">Benefits & harms of the options</td><td>What is the overall certainty of this evidence?</td><td>○ No included studies
● Very low
○ Low
○ Moderate
○ High</td><td rowspan="2">The relative importance or values of the main outcomes of interest:

Summary of findings:

<table><tr><th>Outcomes</th><th>Sensitivity % (95% CI)</th><th>Specificity % (95% CI)</th><th>Certainty of the evidence (GRADE)</th></tr><tr><td>Maternal morbidity</td><td>40 – 100* (not estimable)</td><td>3.6 - 96.9* (not estimable)</td><td>⨁◯◯◯ VERY LOW</td></tr><tr><td>Maternal death</td><td>97 (not estimable)</td><td>87 (not estimable)</td><td>⨁◯◯◯ VERY LOW</td></tr><tr><td>ICU admission</td><td>65.0-96.0* (not estimable)</td><td>54.0-89.0* (not estimable)</td><td>⨁◯◯◯ VERY LOW</td></tr><tr><td>Hospital length of stay</td><td>Not reported</td><td>Not reported</td><td>⨁◯◯◯ VERY LOW</td></tr></table></td><td rowspan="2">The benefits outweigh the harms as it improves woman-centred care.

Ultimately it is more important to escalate care when concerned rather than to preserve the escalation guide and only follow vital sign triggers. As more than a quarter of HDU admissions were based on escalation from clinical judgment in Maguire et al. (2016), this recommendation is paramount to continuing with the provision of quality care.</td></tr>
<tr><td>Is there important uncertainty about how much people value the main outcomes?</td><td>○ Important uncertainty or variability
○ Possibly important uncertainty or variability
● Probably no important uncertainty of variability
● No important uncertainty of variability
○ No known</td></tr>
</table>

	Criteria	Judgements	Research evidence	Additional considerations
		undesirable		
	Are the desirable anticipated effects large?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
	Are the undesirable anticipated effects small?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
	Are the desirable effects large relative to undesirable effects?	○ No ○ Probably no ● Uncertain ○ Probably yes		

	Criteria	Judgements	Research evidence	Additional considerations
		○ Yes ○ Varies		
Resource use	**Are the resources required small?**	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies	One conference abstract provided cost-effectiveness data which found that the use of a maternal early warning trigger tool reduced severe maternal morbidity which resulted in significant cost savings.	
	Is the incremental cost small relative to the net benefits?	○ No ○ Probably no ○ Uncertain ○ Probably yes ● Yes ○ Varies		
Equity	**What would be the impact on health inequities?**	○ Increased ○ Probably increased ● Uncertain ○ Probably	No research evidence was found about the impact of recommending early warning systems on equity.	

	Criteria	Judgements	Research evidence	Additional considerations
		reduced O Reduced O Varies		
Acceptability	**Is the option acceptable to key stakeholders?**	O No O Probably no O Uncertain O Probably yes ● Yes O Varies	A national clinical audit of compliance with the IMEWS Clinical Practice Guideline in selected Irish maternity hospitals/units, found that six out of seven hospitals sampled were using the IMEWS at the time of the audit (May – November 2014). Within the six hospitals using IMEWS, the clinical audit concluded that compliance with vital signs recording was good and the majority of hospitals demonstrated a high level of compliance in relation to escalating the necessary clinical care in cases of red and multiple yellow triggers. However, compliance in relation to the consistent completion of accurate scores when taking sets of observations needed improvement.	This recommendation was part of the original guideline and is already in use within the hospitals.
Feasibility	**Is the option feasible to implement?**	O No O Probably no O Uncertain O Probably yes ● Yes O Varies	A national clinical audit of compliance with the IMEWS Clinical Practice Guideline in selected Irish maternity hospitals/units, found that six out of seven hospitals sampled were using the IMEWS at the time of the audit (May – November 2014).	As above.

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 and be escalated according to the escalation guide.

Quality of the evidence	● No included studies O Very low O Low O Moderate O High
Strength of recommendation	Strong

	Criteria	Judgements	Research evidence	Additional considerations
Problem	**Is there a problem priority?**	O No O Probably no ● Uncertain O Probably yes O Yes O Varies		Clinical concern is universally regarded as essential. Judgment or concern from those familiar with the woman must always be taken seriously and acted on.
Benefits & harms of the options	**What is the overall certainty of this evidence?**	● No included studies O Very low O Low O Moderate O High	No research evidence was found in relation to staff or family concern as a parameter in the systematic review.	

	Criteria	Judgements	Research evidence	Additional considerations
	Is there important uncertainty about how much people value the main outcomes?	○ Important uncertainty or variability ○ Possibly important uncertainty or variability ● Probably no important uncertainty of variability ○ No important uncertainty of variability ○ No known undesirable		
	Are the desirable anticipated effects large?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
	Are the undesirable	○ No		

	Criteria	Judgements	Research evidence	Additional considerations
	anticipated effects small?	○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
	Are the desirable effects large relative to undesirable effects?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
Resource use	**Are the resources required small?**	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies	One conference abstract provided cost-effectiveness data which found that the use of a maternal early warning trigger tool reduced severe maternal morbidity which resulted in significant cost savings.	
	Is the incremental cost small relative to the net benefits?	○ No ○ Probably no ○ Uncertain		

	Criteria	Judgements	Research evidence	Additional considerations
		○ Probably yes ● Yes ○ Varies		
Equity	**What would be the impact on health inequities?**	○ Increased ○ Probably increased ○ Uncertain ○ Probably reduced ○ Reduced ● Varies	No research evidence was found about the impact of early warning system parameters on equity.	
Acceptability	**Is the option acceptable to key stakeholders?**	○ No ○ Probably no ○ Uncertain ● Probably yes ○ Yes ○ Varies		With woman-centred care and safety as a priority, flexibility in the tool to include concern from a clinician or family member allows for escalation without triggers and is an extension of the status quo.
Feasibility	**Is the option feasible to implement?**	○ No ○ Probably no ○ Uncertain		There are no costs associated with integrating clinical/family concern

	Criteria	Judgements	Research evidence	Additional considerations
		○ Probably yes ● Yes ○ Varies		

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 the evidence	○ No included studies ● Very low ○ Low ○ Moderate ○ High
Strength of recommendation	Conditional

Recommendation 5

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

Quality of the evidence	○ No included studies ● Very low ○ Low ○ Moderate

	○ High
Strength of recommendation	Strong

Recommendation 6

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

Quality of the evidence	● No included studies ○ Very low ○ Low ○ Moderate ○ High
Strength of recommendation	Strong

Evidence Table Recommendations 4-6

	Criteria	Judgements	Research evidence	Additional considerations
Problem	**Is there a problem priority?**	○ No ○ Probably no ○ Uncertain ○ Probably yes ● Yes ○ Varies		
Benefits &	**What is the overall**	○ No included	The previous review identified six studies (reported across nine citations) on	

	Criteria	Judgements	Research evidence	Additional considerations
harms of the options	**certainty of this evidence?**	studies ● Very low ○ Low ○ Moderate ○ High	the development/validation of MEWS and the review update identified eight additional studies. The studies included reported wide variation in predictive physiological parameters depending on the maternity early warning systems used. Respiratory rate, blood pressure and temperature were the most commonly included parameters. Evidence from the clinical audit literature (18 obstetric audits) highlights that compliance rates with early warning scores and complete documentation of all parameters is often poor, with accurate completion of parameters reported to be between 6% and 92%. Instructions about observation frequency were not always provided but where they were, differences in observation frequency were found and the evidence regarding optimal frequency for vital sign measurement is limited. Research evidence on techniques of recording, measuring and monitoring of vital signs was not part of the systematic review search.	
	Is there important uncertainty about how much people value the main outcomes?	○ Important uncertainty or variability ○ Possibly important uncertainty or variability ● Probably no important uncertainty of variability ○ No important uncertainty of variability ○ No known undesirable		
	Are the desirable anticipated effects	○ No		

	Criteria	Judgements	Research evidence	Additional considerations
	large?	○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
	Are the undesirable anticipated effects small?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
	Are the desirable effects large relative to undesirable effects?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
Resource use	**Are the resources required small?**	○ No ○ Probably no	One conference abstract provided cost-effectiveness data which found that the use of a maternal early warning trigger tool reduced severe maternal	

	Criteria	Judgements	Research evidence	Additional considerations
		● Uncertain O Probably yes O Yes O Varies	morbidity which resulted in significant cost savings.	
	Is the incremental cost small relative to the net benefits?	O No O Probably no O Uncertain O Probably yes O Yes O Varies	Budget impact may inform this	
Equity	**What would be the impact on health inequities?**	O Increased O Probably increased O Uncertain O Probably reduced O Reduced O Varies	No research evidence was found about the impact of recommending early warning systems on equity.	

	Criteria	Judgements	Research evidence	Additional considerations
Acceptability	**Is the option acceptable to key stakeholders?**	○ No ○ Probably no ○ Uncertain ● Probably yes ○ Yes ○ Varies	A national clinical audit of compliance with the IMEWS Clinical Practice Guideline in selected Irish maternity hospitals/units, found that six out of seven hospitals sampled were using the IMEWS at the time of the audit (May – November 2014). Within the six hospitals using IMEWS, the clinical audit concluded that compliance with vital signs recording was good and the majority of hospitals demonstrated a high level of compliance in relation to escalating the necessary clinical care in cases of red and multiple yellow triggers. However, compliance in relation to the consistent completion of accurate scores when taking sets of observations needed improvement.	
Feasibility	**Is the option feasible to implement?**	○ No ○ Probably no ○ Uncertain ○ Probably yes ○ Yes ○ Varies	A national clinical audit of compliance with the IMEWS Clinical Practice Guideline in selected Irish maternity hospitals/units, found that six out of seven hospitals sampled were using the IMEWS at the time of the audit (May – November 2014).	

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 of the evidence	● No included studies ○ Very low ○ Low ○ Moderate ○ High
Strength of recommendation	Strong

	Criteria	Judgements	Research evidence	Additional considerations
Problem	**Is there a problem priority?**	O No O Probably no O Uncertain O Probably yes ● Yes O Varies		ISBAR is the NCEC recommended tool in the Communication (Clinical Handover) in Maternity services NCG no. 5. And in the Communication (Clinical Handover) in Acute and Children's Services NCG no. 11. There is a risk of failure to communicate effectively without the implementation of a structured tool.
Benefits & harms of the options	**What is the overall certainty of this evidence?**	● No included studies OVery low O Low O Moderate	No research evidence was found in relation to the effectiveness of communication tools as part of the systematic review.	See above, the ISBAR is already recommended. ISBAR helps to deliver an effective exchange of communication and follows a format that, when

	Criteria	Judgements	Research evidence	Additional considerations
		○ High		followed, will help ensure no important information is missing. Therefore the benefits outweigh any harms. No harms expected. Better outcomes for women's will follow with an evidence-based strategy for communication.
	Is there important uncertainty about how much people value the main outcomes?	○ Important uncertainty or variability ○ Possibly important uncertainty or variability * Probably no important uncertainty of variability ○ No important uncertainty of variability ○ No known undesirable		
	Are the desirable anticipated effects large?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		

	Criteria	Judgements	Research evidence	Additional considerations
	Are the undesirable anticipated effects small?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
	Are the desirable effects large relative to undesirable effects?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
Resource use	**Are the resources required small?**	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		ISBAR should already be in place as the recommended communication tool. However, some units will need training, education and leadership where ISBAR is not being used. On-going monitoring and evaluation will also be necessary.
	Is the incremental cost small relative to the net	○ No ○ Probably no		

	Criteria	Judgements	Research evidence	Additional considerations
	benefits?	● Uncertain O Probably yes O Yes O Varies		
Equity	**What would be the impact on health inequities?**	O Increased O Probably increased ● Uncertain O Probably reduced O Reduced O Varies	No research evidence was found about the impact communication tools on equity.	
Acceptability	**Is the option acceptable to key stakeholders?**	O No O Probably no O Uncertain ● Probably yes O Yes O Varies		Likely yes as ISBAR is not new to the hospitals.
Feasibility	**Is the option feasible to implement?**	O No O Probably no		

	Criteria	Judgements	Research evidence	Additional considerations
		○ Uncertain ● Probably yes ○ Yes ○ Varies		

Recommendation 8

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

Quality of the evidence	○No included studies ● Very low ○ Low ○ Moderate ○ High
Strength of recommendation	Strong

	Criteria	Judgements	Research evidence	Additional considerations
Problem	**Is there a problem priority?**	○ No ○ Probably no ○ Uncertain ○ Probably yes ● Yes		There are existing guidance documents in place to facilitate high quality and standardised documentation including; HSE, Standards and Recommended Practices for

	Criteria	Judgements	Research evidence	Additional considerations
		O Varies		Health Records Management QPSD-D-006-3 V3.0, 2011 Nursing and Midwifery Board of Ireland, Recording Clinical Practice Professional Guidance, 2015
Benefits & harms of the options	**What is the overall certainty of this evidence?**	O No included studies ●Very low O Low O Moderate O High	Evidence from the clinical audit literature (18 obstetric audits) highlights that compliance rates with documentation of actions taken is often poor. Clear escalation protocols were not always in place but where they were, documentation of escalation was also poor.	Benefits include adhering to existing practice and keeping in line with recommended guidance policy documents. No foreseen harms.
	Is there important uncertainty about how much people value the main outcomes?	O Important uncertainty or variability O Possibly important uncertainty or variability * Probably no important uncertainty of variability O No important		

	Criteria	Judgements	Research evidence	Additional considerations
		uncertainty of variability O No known undesirable		
	Are the desirable anticipated effects large?	O No O Probably no ● Uncertain O Probably yes O Yes O Varies		
	Are the undesirable anticipated effects small?	O No O Probably no ● Uncertain O Probably yes O Yes O Varies		
	Are the desirable effects large relative to undesirable effects?	O No O Probably no ● Uncertain O Probably yes O Yes		

	Criteria	Judgements	Research evidence	Additional considerations
		○ Varies		
Resource use	**Are the resources required small?**	○ No ○ Probably no ○ Uncertain ○ Probably yes ● Yes ○ Varies		Yes as this should be current practice.
	Is the incremental cost small relative to the net benefits?	○ No ○ Probably no ○ Uncertain ○ Probably yes ● Yes ○ Varies		
Equity	**What would be the impact on health inequities?**	○ Increased ○ Probably increased ● Uncertain ○ Probably reduced ○ Reduced		

	Criteria	Judgements	Research evidence	Additional considerations
		○ Varies		
Acceptability	**Is the option acceptable to key stakeholders?**	○ No ○ Probably no ○ Uncertain ● Probably yes ○ Yes ○ Varies		Yes, documentation is already part of the clinical care.
Feasibility	**Is the option feasible to implement?**	○ No ○ Probably no ○ Uncertain ● Probably yes ○ Yes ○ Varies		Yes, as above

Recommendation 9

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

Quality of the evidence	○ No included studies ● Very low

	○ Low ○ Moderate ○ High
Strength of recommendation	Strong

	Criteria	Judgements	Research evidence	Additional considerations
Problem	**Is there a problem priority?**	○ No ○ Probably no ○ Uncertain ○ Probably yes ● Yes ○ Varies		Escalation forms a large part of the early warning system and as per Recommendation 1, EWS are a priority for several national reports as outlined in Recommendation 1. Improved outcomes are a priority
Benefits & harms of the options	**What is the overall certainty of this evidence?**	○ No included studies ●Very low ○ Low ○ Moderate ○ High	Evidence from the clinical audit literature (18 obstetric audits) highlights that compliance rates with documentation of actions taken is often poor. Clear escalation protocols were not always in place but where they were, documentation of escalation was also poor.	Benefits include improved outcomes, consistency of care, a timely and standardised response to deterioration. Clear communication and team work to optimise care. Harms may include allowing the IMEWS to overtake clinical judgement, therefore delaying
	Is there important	○ Important		

	Criteria	Judgements	Research evidence	Additional considerations
	uncertainty about how much people value the main outcomes?	uncertainty or variability ○ Possibly important uncertainty or variability ○ Probably no important uncertainty of variability ● No important uncertainty of variability ○ No known undesirable		escalation. The opposite is also true that there may be unnecessary escalations.
	Are the desirable anticipated effects large?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
	Are the undesirable anticipated effects	○ No ○ Probably no		

	Criteria	Judgements	Research evidence	Additional considerations
	small?	● Uncertain ○ Probably yes ○ Yes ○ Varies		
	Are the desirable effects large relative to undesirable effects?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
Resource use	**Are the resources required small?**	○ No ○ Probably no ○ Uncertain ○ Probably yes ○ Yes ● Varies		Additional senior obstetric and midwifery staff may be required to ensure timely escalation. There may be different requirements in different units/hospitals.
	Is the incremental cost small relative to the net benefits?	○ No ○ Probably no ○ Uncertain ● Probably yes		

	Criteria	Judgements	Research evidence	Additional considerations
		○ Yes ○ Varies		
Equity	**What would be the impact on health inequities?**	○ Increased ○ Probably increased ○ Uncertain ○ Probably reduced ● Reduced ○ Varies		There would likely be a great difference in treatment for pregnant and postpartum women without the escalation procedure in place. As per the HSE survey, 2012, 12/19 units had an obstetric EWS in place but with varying parameters, inclusion criteria and escalation procedures.
Acceptability	**Is the option acceptable to key stakeholders?**	○ No ○ Probably no ○ Uncertain ○Probably yes ● Yes ○ Varies		Likely yes, the escalation procedure empowers midwives to escalate care and provides a clear structure in monitoring care for a pregnant or postpartum woman. Consistency in care and potential improvement for outcomes make the option acceptable.
Feasibility	**Is the option feasible to implement?**	○ No ○ Probably no ○ Uncertain ○ Probably yes		Manpower evaluation will be required as staff shortages will impact upon getting timely responses to escalation.

	Criteria	Judgements	Research evidence	Additional considerations
		● Yes O Varies		

Recommendation 10

Variances to IMEWS parameters or 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 24hrs and at each admission

Quality of the evidence	● No included studies ○ Very low ○ Low ○ Moderate ○ High
Strength of recommendation	Conditional

	Criteria	Judgements	Research evidence	Additional considerations
Problem	**Is there a problem priority?**	○ No ○ Probably no ○ Uncertain ○ Probably yes ○ Yes ● Varies		It is a priority to allow variances to be made but by whom the variation is made may not be a priority and may vary across hospitals.
Benefits & harms of the options	**What is the overall certainty of this evidence?**	● No included studies ○ Very low ○ Low ○ Moderate ○ High	No research evidence was found in relation to varying parameters as part of the systematic review search.	Benefits include senior clinical input, reducing inappropriate escalation calls, therefore increasing specificity and individualised and women-centred care consistently applied. Harms include the potential where changes may be made inappropriately. This may be overcome through education, audit and permitting only senior medical personnel to amend the parameters.
	Is there important uncertainty about how much people value the main outcomes?	○ Important uncertainty or variability ● Possibly important uncertainty or variability ○ Probably no important uncertainty of variability		

	Criteria	Judgements	Research evidence	Additional considerations
		○ No important uncertainty of variability ○ No known undesirable		
	Are the desirable anticipated effects large?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
	Are the undesirable anticipated effects small?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
	Are the desirable effects large relative to undesirable effects?	○ No ○ Probably no ● Uncertain ○ Probably yes		

	Criteria	Judgements	Research evidence	Additional considerations
		○ Yes ○ Varies		
Resource use	**Are the resources required small?**	○ No ○ Probably no ○ Uncertain ● Probably yes ○ Yes ○ Varies		Education, on-going monitoring and evaluation. Increased monitoring will require more time from the midwifery staff. However this may not mean a change in practice if the recommendation has already been implemented.
	Is the incremental cost small relative to the net benefits?	○ No ○ Probably no ○ Uncertain ● Probably yes ○ Yes ○ Varies		
Equity	**What would be the impact on health inequities?**	○ Increased ○ Probably increased ● Uncertain ○ Probably reduced ○ Reduced		

	Criteria	Judgements	Research evidence	Additional considerations
		○ Varies		
Acceptability	**Is the option acceptable to key stakeholders?**	○ No ○ Probably no ○ Uncertain ○ Probably yes ● Yes ○ Varies		Yes, common cases include where blood pressure is a common vital sign to be amended in cases of hypertensive disorders.
Feasibility	**Is the option feasible to implement?**	○ No ○ Probably no ○ Uncertain ○ Probably yes ● Yes ○ Varies		This is already being done in practice.

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 Irish Maternity Early Warning System (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 the evidence	●No included studies ○ Very low

	○ Low ○ Moderate ○ High
Strength of recommendation	Conditional

Recommendation 12

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

Quality of the evidence	● No included studies ○ Very low ○ Low ○ Moderate ○ High
Strength of recommendation	Strong

Recommendation 13

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

Quality of the evidence	● No included studies ○ Very low ○ Low ○ Moderate ○ High
Strength of recommendation	Strong

Recommendation 15

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

Quality of the evidence	● No included studies ○ Very low ○ Low ○ Moderate ○ High
Strength of recommendation	Conditional

	Criteria	Judgements	Research evidence	Additional considerations
Problem	**Is there a problem priority?**	O No O Probably no O Uncertain ● Probably yes O Yes O Varies		Lack of clear governance and ownership of IMEWS is accountable for the ongoing difficulties in implementation which is a risk to its success. Additional safety practices and appropriate resources to deliver emergency care are a requirement to successfully delivering a robust maternity service and to optimising positive clinical outcomes.
Benefits & harms of the options	**What is the overall certainty of this evidence?**	● No included studies OVery low O Low	Research evidence on organisational supports and governance structures were not included in the systematic review	Oversight and leadership will sustain consistency, standardisation and high quality of health care practice. Research evidence would be unlikely to

	Criteria	Judgements	Research evidence	Additional considerations
		○ Moderate ○ High	search.	change these recommendations.
	Is there important uncertainty about how much people value the main outcomes?	○ Important uncertainty or variability ○ Possibly important uncertainty or variability ● Probably no important uncertainty of variability ○ No important uncertainty of variability ○ No known undesirable		
	Are the desirable anticipated effects large?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes		

	Criteria	Judgements	Research evidence	Additional considerations
		○ Varies		
	Are the undesirable anticipated effects small?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
	Are the desirable effects large relative to undesirable effects?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
Resource use	**Are the resources required small?**	○ No ○ Probably no ○ Uncertain ● Probably yes ○ Yes ○ Varies		There is a time commitment/cost from the named IMEWS contact, local EWS team and those accountable for IMEWS. It is expected that emergency resources are already available in all units. Standard upkeep of equipment is necessary.

	Criteria	Judgements	Research evidence	Additional considerations
	Is the incremental cost small relative to the net benefits?	○ No ○ Probably no ○ Uncertain ○ Probably yes ● Yes ○ Varies		
Equity	**What would be the impact on health inequities?**	○ Increased ○ Probably increased ○ Uncertain ● Probably reduced ○ Reduced ○ Varies		
Acceptability	**Is the option acceptable to key stakeholders?**	○ No ○ Probably no ○ Uncertain ○ Probably yes ● Yes ○ Varies		Yes, IMEWS is already embedded in the system but further consistent and local action may be required, if not already in place, to continue successful implementation.

	Criteria	Judgements	Research evidence	Additional considerations
Feasibility	**Is the option feasible to implement?**	○ No ○ Probably no ○ Uncertain ○ Probably yes ● Yes ○ Varies		Yes, the benefits outweigh the harms and the cost is minimal

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 the evidence	○ No included studies ● Very low ○ Low ○ Moderate ○ High
Strength of recommendation	Strong

	Criteria	Judgements	Research evidence	Additional considerations
Problem	**Is there a problem**	○ No		Education was the single most requested topic at the IMEWS day in November 2017. Known

	Criteria	Judgements	Research evidence	Additional considerations
	priority?	○ Probably no ○ Uncertain ○ Probably yes ● Yes ○ Varies		barriers to implementation include the lack of formalised education. HSE NIMT 50278 Recommendation 3 recommends that "The HSE should also develop multidisciplinary educational programmes to improve the quality of care in pregnancies complicated by infection" which would include IMEWS (Health Service Executive, 2013).
Benefits & harms of the options	**What is the overall certainty of this evidence?**	○ No included studies ● Very low ○ Low ○ Moderate ○ High	This current review did not identify any evaluations of education programmes in the delivery of early warning scores. 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. Many of the literature from reviewing clinical audits relating to EWS included education and ongoing audits as necessary to improve compliance rates. Recommendations from the included clinical audit literature (18 obstetric audits) include education and training for midwifery and obstetric staff. What form this education should take, how often it should be conducted and who should deliver and	Benefits include improved confidence in using the tool, quality assurance and compliance. There are no foreseen harms.
	Is there important uncertainty about how much people value the main outcomes?	○ Important uncertainty or variability ○ Possibly important uncertainty or variability ○ Probably no		

	Criteria	Judgements	Research evidence	Additional considerations
		important uncertainty of variability ● No important uncertainty of variability ○ No known undesirable	attend is not clear from the literature.	
	Are the desirable anticipated effects large?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
	Are the undesirable anticipated effects small?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		

	Criteria	Judgements	Research evidence	Additional considerations
	Are the desirable effects large relative to undesirable effects?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
Resource use	**Are the resources required small?**	○ No ● Probably no ○ Uncertain ○ Probably yes ○ Yes ○ Varies	The budget impact analysis estimates this cost to be between €369,845 - €2.9 million over a 5 year period depending on the approach used to educate staff.	Time for all healthcare staff involved in IMEWS to be released for training. This is likely the largest cost.
	Is the incremental cost small relative to the net benefits?	○ No ○ Probably no ○ Uncertain ● Probably yes ○ Yes ○ Varies		
Equity	**What would be the impact on health**	○ Increased		

	Criteria	Judgements	Research evidence	Additional considerations
	inequities?	○ Probably increased ○ Uncertain ○ Probably reduced ● Reduced ○ Varies		
Acceptability	**Is the option acceptable to key stakeholders?**	○ No ○ Probably no ○ Uncertain ○ Probably yes ● Yes ○ Varies	A national clinical audit of compliance with the IMEWS Clinical Practice Guideline in selected Irish maternity hospitals/units, found that six out of seven hospitals sampled were using the IMEWS at the time of the audit (May – November 2014). Within the six hospitals using IMEWS, the clinical audit concluded that compliance with vital signs recording was good and the majority of hospitals demonstrated a high level of compliance in relation to escalating the necessary clinical care in cases of red and multiple yellow triggers. However, compliance in relation to the consistent completion of accurate scores when taking sets of observations needed improvement.	Compliance is necessary to implement IMEWS and education is a means to achieving this. As IMEWS is mandated and used in all maternity cases, standardised education would be very welcomed amongst the healthcare staff, especially those in the acute hospital services where caring for a pregnant patient is rare.
Feasibility	**Is the option feasible to implement?**	○ No ○ Probably no		

	Criteria	Judgements	Research evidence	Additional considerations
		○ Uncertain ● Probably yes ○ Yes ○ Varies		

Recommendation 16

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

Quality of the evidence	○ No included studies ● Very low ○ Low ○ Moderate ○ High
Strength of recommendation	Strong

	Criteria	Judgements	Research evidence	Additional considerations
Problem	**Is there a problem priority?**	○ No ○ Probably no ○ Uncertain ● Probably yes ○ Yes		Audit and education are reported to be the main routes to increase compliance. Similar to any plan-do-study-act cycle, audit data is required to detect improvements and gaps in implementation.

	Criteria	Judgements	Research evidence	Additional considerations
		○ Varies		National documents support audit; A practical guide to clinical audit (Quality and Patient Safety Directorate, 2013) and the National standards for safer better healthcare (Health Information and Quality Authority, 2012).
Benefits & harms of the options	**What is the overall certainty of this evidence?**	○ No included studies ● Very low ○ Low ○ Moderate ○ High	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 poor. 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 poor compliance and also suggested routine audit as a mechanism to increase compliance	
	Is there important uncertainty about how much people value the main outcomes?	○ Important uncertainty or variability ○ Possibly important uncertainty or variability ● Probably no important uncertainty of variability ○ No important uncertainty of variability ○ No known undesirable		

	Criteria	Judgements	Research evidence	Additional considerations
	Are the desirable anticipated effects large?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
	Are the undesirable anticipated effects small?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
	Are the desirable effects large relative to undesirable effects?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
Resource	**Are the resources**	○ No		

	Criteria	Judgements	Research evidence	Additional considerations
use	**required small?**	○ Probably no ○ Uncertain ● Probably yes ○ Yes ○ Varies		
	Is the incremental cost small relative to the net benefits?	○ No ○ Probably no ○ Uncertain ● Probably yes ○ Yes ○ Varies		
Equity	**What would be the impact on health inequities?**	○ Increased ○ Probably increased ○ Uncertain ● Probably reduced ○ Reduced ○ Varies	No research evidence was found about the impact of recommending early warning systems on equity.	

	Criteria	Judgements	Research evidence	Additional considerations
Acceptability	**Is the option acceptable to key stakeholders?**	○ No ○ Probably no ○ Uncertain ○ Probably yes ● Yes ○ Varies	A national clinical audit of compliance with the IMEWS Clinical Practice Guideline in selected Irish maternity hospitals/units, found that six out of seven hospitals sampled were using the IMEWS at the time of the audit (May – November 2014). Within the six hospitals using IMEWS, the clinical audit concluded that compliance with vital signs recording was good and the majority of hospitals demonstrated a high level of compliance in relation to escalating the necessary clinical care in cases of red and multiple yellow triggers. However, compliance in relation to the consistent completion of accurate scores when taking sets of observations needed improvement. The audit recommended a ward based self-assessment audit programme for IMEWS in all hospitals with results made available to nursing/midwifery staff.	
Feasibility	**Is the option feasible to implement?**	○ No ○ Probably no ○ Uncertain ○ Probably yes ● Yes ○ Varies		

Recommendation 18

A dedicated midwife/nurse with the appropriate clinical knowledge should be designated in each of the six hospital groups to provide education and training on IMEWS to staff members in the maternity and acute hospitals within their hospital network. This person should also oversee regular local audits of IMEWS.

Quality of the evidence	● No included studies ○ Very low ○ Low ○ Moderate ○ High
Strength of recommendation	Conditional

	Criteria	Judgements	Research evidence	Additional considerations
Problem	**Is there a problem priority?**	○ No ○ Probably no ○ Uncertain ● Probably yes ○ Yes ○ Varies		This recommendation links Recommendations 17 & 18 and both the same judgement of 'probably yes'. As implementation is the main barrier to sustained success this recommendation is warranted. Education in the acute hospitals division should receive support from their local maternity units and this is a means to deliver that support. In addition, continuous audit will inform education and therefore this needs to be linked.
Benefits & harms of the options	**What is the overall certainty of this evidence?**	○ No included studies ● Very low ○ Low ○ Moderate ○ High		No harms foreseen. Having a single source for education, training and audit within the hospital groups will standardise the implementation of IMEWS.
	Is there important uncertainty about how much people value the main outcomes?	○ Important uncertainty or variability ○ Possibly important uncertainty or variability ● Probably no important		

	Criteria	Judgements	Research evidence	Additional considerations
		uncertainty of variability ○ No important uncertainty of variability ○ No known undesirable		
	Are the desirable anticipated effects large?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
	Are the undesirable anticipated effects small?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
	Are the desirable effects	○ No		

	Criteria	Judgements	Research evidence	Additional considerations
	large relative to undesirable effects?	○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
Resource use	**Are the resources required small?**	○ No ● Probably no ○ Uncertain ○ Probably yes ○ Yes ○ Varies	Estimated at €2.1 million over a 5 year period	This is a new recommendation and will require some resources; 6 WTE midwives, one for each hospital group.
	Is the incremental cost small relative to the net benefits?	○ No ○ Probably no ○ Uncertain ● Probably yes ○ Yes ○ Varies		
Equity	**What would be the impact on health**	○ Increased		

	Criteria	Judgements	Research evidence	Additional considerations
	inequities?	○ Probably increased ● Uncertain ○ Probably reduced ○ Reduced ○ Varies		
Acceptability	**Is the option acceptable to key stakeholders?**	○ No ○ Probably no ○ Uncertain ● Probably yes ○ Yes ○ Varies		
Feasibility	**Is the option feasible to implement?**	○ No ○ Probably no ○ Uncertain ● Probably yes ○ Yes ○ Varies		

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 the evidence	● No included studies ○ Very low ○ Low ○ Moderate ○ High
Strength of recommendation	Conditional

	Criteria	Judgements	Research evidence	Additional considerations
Problem	**Is there a problem priority?**	○ No ● Probably no ○ Uncertain ○ Probably yes ○ Yes ○ Varies		
Benefits & harms of the options	**What is the overall certainty of this evidence?**	○ No included studies ● Very low ○ Low		These methods improve engagement and support local adoption. No foreseen harms

	Criteria	Judgements	Research evidence	Additional considerations
		○ Moderate ○ High		
	Is there important uncertainty about how much people value the main outcomes?	○ Important uncertainty or variability ○ Possibly important uncertainty or variability ○ Probably no important uncertainty of variability ● No important uncertainty of variability ○ No known undesirable		
	Are the desirable anticipated effects large?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
	Are the undesirable anticipated effects small?	○ No ○ Probably no		

	Criteria	Judgements	Research evidence	Additional considerations
		● Uncertain ○ Probably yes ○ Yes ○ Varies		
	Are the desirable effects large relative to undesirable effects?	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		
Resource use	**Are the resources required small?**	○ No ○ Probably no ● Uncertain ○ Probably yes ○ Yes ○ Varies		Resources will include staff time for the QI process and education. Existing structures may be used such as risk, quality or patient safety divisions.
	Is the incremental cost small relative to the net benefits?	○ No ○ Probably no		

	Criteria	Judgements	Research evidence	Additional considerations
		○ Uncertain ○ Probably yes ● Yes ○ Varies		
Equity	**What would be the impact on health inequities?**	○ Increased ○ Probably increased ● Uncertain ○ Probably reduced ○ Reduced ○ Varies		
Acceptability	**Is the option acceptable to key stakeholders?**	○ No ○ Probably no ○ Uncertain ● Probably yes ○ Yes ○ Varies		Hospitals and units can use their own quality improvement methodology already existing within their services.
Feasibility	**Is the option feasible to implement?**	○ No ○ Probably no		

	Criteria	Judgements	Research evidence	Additional considerations
		○ Uncertain ● Probably yes ○ Yes ○ Varies		

References

Centre for Maternal and Child Enquiries (CMACE), 2011. Saving Mothers' Lives: reviewing maternal deaths to make motherhood safer: 2006–08. The Eighth Report on Confidential Enquiries into Maternal Deaths in the Uni- ted Kingdom. BJOG 118, 1–203.

Health Information and Quality Authority, 2013. Patient Safety Investigation report into the services at University Hospital Galway (UHG) and as reflected in the care provided to Savita Halappanavar.

Health Information and Quality Authority, 2012. National Standards for Safer Better Healthcare.

Health Service Executive, 2013. Investigation of Incident 50278.

Health Service Executive, 2008. Report into the circumstances pertaining to the death of Mrs Tania McCabe and her infant son Zach at Our Lady of Lourdes Hospital, Drogheda on Friday 9 March, 2007.

Lewis (ed), 2007. The Confidential Enquiry into Maternal and Child Health (CEMACH). Saving Mothers' Lives: reviewing maternal deaths to make motherhood safer - 2003-2005. The Seventh Report on Confidential Enquiries into Maternal Deaths in the United Kingdom. CEMACH, London.

NCEC, 2014. Sepsis Management National Clinical Guideline No. 6.

Quality and Patient Safety Directorate, 2013. A Practical Guide to Clinical Audit QPSD-D-029-1.