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Original Article

Vital signs and other observations used to detect deterioration in pregnant women: an analysis of vital sign charts in consultant-led UK maternity units

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1 **IJOA 16-00229**

2 ORIGINAL ARTICLE

3 **Vital signs and other observations used to detect deterioration in pregnant women: an**
4 **analysis of vital sign charts in consultant-led UK maternity units**

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20

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25

26 ABSTRACT

27 **Background:** Obstetric early warning systems are recommended for monitoring hospitalised
28 pregnant and postnatal women. We decided to compare: (i) vital sign values used to define
29 physiological normality; (ii) symptoms and signs used to escalate care; (iii) type of chart
30 used; and (iv) presence of explicit instructions for escalating care.

31 **Methods:** One hundred and twenty obstetric early warning charts and escalation protocols
32 were obtained from consultant-led maternity units in the UK and Channel Islands. These data
33 were extracted: values used to determine normality for each maternal vital sign; chart colour-
34 coding; instructions following early warning system triggering; other criteria used as triggers.

35 **Results:** There was considerable variation in the charts, warning systems and escalation
36 protocols. Of 120 charts, 89.2% used colour; 69.2% used colour-coded escalation systems.
37 Forty-one (34.2%) systems required the calculation of weighted scores. Seventy-five discrete
38 combinations of ‘normal’ vital sign ranges were found, the most common being: heart rate =
39 50–99 beats/min; respiratory rate = 11–20 breaths/min; blood pressure, systolic = 100–149
40 mmHg, diastolic = ≤ 89 mmHg; S_pO_2 = 95–100%; temperature = 36.0–37.9°C; and AVPU
41 assessment = Alert. Most charts (90.8%) provided instructions about who to contact
42 following triggering, but only 41.7% gave instructions about subsequent observation
43 frequency.

44 **Conclusion:** The wide range of ‘normal’ vital sign values in different systems suggests a lack
45 of equity in the processes for detecting deterioration and escalating care in hospitalised
46 pregnant and postnatal women. Agreement regarding ‘normal’ vital sign ranges is urgently
47 required and would assist the development of a standardised obstetric early warning system
48 and chart.

49
50 **Keywords:** Obstetric Emergency Team; Patient Safety; Standards of Care; Trigger Tools;
51 Maternity; Women’s health.

53 Introduction

54 Early warning systems are recommended for monitoring the condition of hospitalised
55 pregnant and postnatal women, to facilitate early detection and management of clinical
56 deterioration.¹⁻⁶ Some maternity units use systems designed primarily for the non-pregnant
57 population.⁷ Others employ obstetric-specific systems comprising ‘calling criteria’ based on
58 maternal vital sign measurements, symptoms and clinical signs, and conditions that

59 commonly cause maternal morbidity and mortality.⁸⁻¹⁰ The regular measurement of a
60 woman's vital signs is a universal feature of obstetric early warning systems (ObsEWS) and
61 choosing the correct normal ranges for measured variables is fundamental to their
62 appropriate, safe and efficient use.¹¹ However, publications suggest that ObsEWS vary with
63 respect to the included vital signs and physiological values used to reflect normality.¹⁻¹⁰

64 Several types of ObsEWS exist. Some trigger a clinical response by a midwife,
65 obstetrician or rapid-response team,¹² when one or more abnormal observations are
66 identified.³ Others trigger the same response when one or more markedly abnormal, or two or
67 more mildly abnormal, observations are present.^{13,14} These systems are frequently used
68 alongside charts featuring colour-coded shading to highlight markedly and mildly abnormal
69 vital signs ranges, often shaded in red and yellow, respectively (Fig. 1).^{1,15} A third type of
70 ObsEWS allocates points in a weighted manner, based on the derangement of a woman's
71 measured vital signs from pre-defined 'normal' ranges (Table 1).^{16,17} The sum of these points,
72 known as the early warning score (EWS), is used to direct subsequent care. Some hospitals
73 use combinations of the three systems.

74 We decided to analyse early warning charts in routine use in consultant-led maternity
75 units in the UK and Channel Islands to establish vital sign values used to determine normality
76 in ObsEWS. We also identified other items used as triggers for escalating care (e.g. maternal
77 symptoms, clinical signs and conditions), the type of vital signs chart used and the presence
78 of explicit instructions for escalating care.

79

80 **Methods**

81 We wrote to all lead consultant anaesthetists registered with the Obstetric Anaesthetists'
82 Association (OAA) to request participation in an analysis of obstetric early warning charts,
83 ObsEWS and associated escalation protocols used in consultant-led maternity units in the UK
84 and Channel Islands. Contact details were provided by the OAA. We requested a copy of the
85 vital signs/ObsEWS chart and associated escalation protocol used in each unit. Invitees were
86 asked to send these by email or mail (a stamped-addressed envelope was provided). Invitees
87 were assured that all data would remain confidential, and no hospital identifiers would be
88 revealed during presentations or publications arising from the study. The study extended two
89 earlier OAA-approved surveys (Nos. 76 & 135) into UK ObsEWS and escalation policies,
90 undertaken by members of our group.^{8,9}

91 Non-responding leads/units were contacted again via telephone, follow-up letter and
92 email. All were contacted a minimum of seven times (one telephone call, three letters and

93 three emails). All documentation received by the study group was scanned, given a unique
94 hospital identifier (No. 1–194) and uploaded to a secure database for analysis.

95 Two members of the research team (GS and RI) analysed each chart individually, and
96 created a spreadsheet containing amalgamated data. Where opinions differed, charts were re-
97 checked to establish a single result for each data item.

98 We documented whether each obstetric early warning chart was colour-coded, and if
99 the chart identified: (i) who to call on ObsEWS triggering; and (ii) the frequency of vital
100 signs monitoring expected after activation. We identified items used as triggers for escalation
101 (i.e. vital signs, maternal symptoms, clinical signs, and conditions) from the chart alone, or,
102 where necessary, from the chart and the associated EWS. For each maternal vital sign
103 parameter studied (i.e. respiratory rate (RR), heart rate (HR), systolic blood pressure (sBP),
104 diastolic blood pressure (dBP), mean blood pressure (mBP), temperature (T), AVPU (Alert-
105 Voice-Pain-Unresponsive) and oxygen saturation (S_pO_2)), we noted (a) whether it was used
106 as a component of the ObsEWS, and (b) the values used to determine physiological normality
107 on the vital signs chart or, if used, in the EWS. Similarly, we did the same for Glasgow Coma
108 Score (GCS), maternal urine output and maternal oxygen administration. In addition, we
109 noted whether other observations, criteria or abnormalities (e.g. presence of maternal
110 proteinuria; uterine tone; maternal pain) were used as triggers in the early warning system.

111 In line with guidance from the NHS Health Research Authority, this service
112 evaluation did not require ethical review by an NHS or Social Care Research Ethics
113 Committee or management permission through the NHS R&D office. Approval for the study
114 was obtained from the OAA Surveys Subcommittee.

115

116 **Results**

117 A total of 194 lead obstetric anaesthetists were invited to contribute obstetric early warning
118 charts and escalation protocols from their unit(s). Charts were returned by 127 (65.5%) but
119 seven (3.6%) were unusable (e.g. poor quality photocopy, black and white photocopy where
120 colour-coding was used). Of the 120 charts available for analysis, 88 were from England; 15
121 from Scotland; 11 from Wales; 5 from Northern Ireland and 1 from the Channel Islands.

122 There was considerable variation in the design of obstetric early warning charts. Of
123 the 120 usable charts, 107/120 (89.2%) used colour in some way, but only 83/120 (69.2%)
124 used a colour-coded escalation system. Two different systems were used to escalate care to
125 more experienced staff, or to advise subsequent clinical actions. A colour-coded triggering
126 system similar to that developed in Scotland and described in the 2007 Confidential Enquiry

127 into Maternal and Child Health (CEMACH) report,¹ was used in 79/120 (65.8%) (Fig. 1). A
128 system that required staff to calculate an EWS from an aggregate weighted system was used
129 in 41/120 (34.2%). Where a colour-coded system based on the presence of one or more
130 abnormal observations (red/yellow) was used (n=79), all except one (triggering score not
131 stated) escalated care in the presence of either two yellow vital signs values or one red value.
132 Where an aggregate weighted EWS was used to escalate care (n=41), the lowest aggregate
133 score that triggered a bedside assessment by a doctor was 2 (4/41), 3 (15/41), 4 (15/41), 5
134 (4/41) and 6 (3/41).

135 Table 2 shows aggregated data for vital signs and related measurements used as a
136 component of the trigger system: specifically, number of discrete 'normal' ranges in use
137 across the units surveyed for each individual vital sign; lowest and highest value in any
138 'normal' range; most commonly used 'normal' range; number of charts using the most
139 commonly used 'normal' range; and whether the parameter was (i) used as a component of
140 the triggering system, (ii) recorded but not used in the triggering system, or (iii) not recorded
141 nor used.

142 Variations in vital signs ranges used to define 'normality' for each of: HR, RR, sBP,
143 dBP, SpO₂ and T are shown in Appendix A. For HR, RR, sBP and SpO₂, the most commonly
144 chosen 'normal' range was used in only approximately 50% of units. The most commonly
145 used combination of 'normal' ranges was that described in the CEMACH report,¹ [HR, 50-99
146 beats/min; RR, 11-20 breaths/min; sBP, 100-149 mmHg; dBP, ≤89 mmHg; SpO₂, 95-100%;
147 T, 36.0-37.9°C; and AVPU, A] however, this was used in only 16/120 (13.3%) units. Of the
148 120 charts assessed, 102 (85%) included all seven vital signs that appear on the CEMACH
149 chart (i.e. HR; RR; sBP; dBP; SpO₂; T; AVPU). However, there were 75 discrete
150 combinations of 'normal' ranges in use for these seven vital sign sets. We could find no
151 evidence that any unit used a different ObsEWS for different stages of pregnancy or in the
152 postpartum period.

153 Table 3 shows the range of maternal symptoms and signs, and other clinical
154 observations or measurements used as components of the ObsEWS reviewed. Whilst many of
155 these supplementary observations formed part of a colour-coded chart and triggering system,
156 some of these items contributed weightings to an aggregate EWS value.

157 The baseline frequency for recording vital signs was not always recorded on the
158 ObsEWS charts. Where recorded, it varied between units and was usually every 12 h or more
159 frequent. Only 50/120 (41.7%) units provided instructions about changes in the vital sign
160 measurement frequency once vital sign abnormalities were identified. In these circumstances,

161 the subsequent vital signs measurement frequency was increased to a variable extent, usually
162 to every 15-30 min. Usually, the frequency was determined by the degree of physiological
163 derangement observed. Most charts (109/120; 90.8%) provided instructions about who to
164 contact once the ObsEWS had triggered.

165

166 **Discussion**

167 We found a lack of agreement amongst the ObsEWS employed in consultant-led maternity
168 units in the UK and Channel Islands regarding the most appropriate vital sign parameters to
169 measure and vital sign values regarded as ‘normal’ values for each parameter. These
170 disparities probably exist because there is a paucity of knowledge regarding which vital
171 signs, or combination of vital signs, are predictive of maternal deterioration during and after
172 pregnancy, and this makes it difficult to obtain agreement on the necessary appropriate vital
173 signs to measure routinely or to include in an ObsEWS. Similarly, although it is known that
174 pregnancy alters maternal physiology,¹⁸ data are lacking regarding the normal maternal vital
175 sign ranges for each stage of pregnancy, labour and the postpartum period.¹¹

176 Uncertainties arising from these knowledge gaps result in potential conflicts in
177 maternal care. The vital sign normal ranges in several ObsEWS studied lie outside the
178 recently published reference ranges in healthy term pregnant women undergoing caesarean
179 section.¹⁹ More than 20% of units which include S_pO_2 in their ObsEWS use an S_pO_2 ‘normal’
180 range with a lower limit below 94%, i.e. below the British Thoracic Society recommended
181 lower limit for target S_pO_2 during pregnancy.²⁰ The normal ranges used for some parameters
182 overlap with those used to highlight possible sepsis,²¹⁻²³ which is especially concerning as
183 sepsis is a significant direct cause of maternal mortality and morbidity.²⁴ There are also
184 examples of blood pressure ‘normal’ ranges overlapping with those used by the National
185 Institute for Health and Care Excellence to define mild diastolic and severe systolic
186 hypertension in pregnancy.²⁵ In addition, parameters and normal values used in units in the
187 UK and Channel Islands are also different to those being used in iMEWS in Ireland² and in
188 the Maternal Early Warning Criteria recommended in the USA.³ Data collection to establish
189 a set of ‘normal’ vital signs ranges for pregnancy is currently underway¹¹ and may lead to
190 resolution of some of these uncertainties and disparities.

191 Determination of a set of ‘normal’ vital signs ranges for pregnancy would facilitate
192 development of a single validated ObsEWS for the UK and Channel Islands, although a
193 particular challenge will be identification of suitable clinical outcomes against which
194 ObsEWS can be validated. It would also be important to identify whether it is necessary or

195 feasible to introduce a different ObsEWS for each phase of pregnancy. Introducing a
196 different ObsEWS for each phase might be impractical since introducing just a single
197 standardised ObsEWS can be challenging.^{26,27}

198 There was also variation in ObsEWS and vital signs charts used in the 120 units. Most
199 units use a chart similar to that in the 2007 CEMACH report, employing a two-colour
200 triggering system, but in many units the chart had been modified. The remainder used an
201 aggregate weighted triggering system requiring calculation of an EWS. There was also
202 variation concerning when and how to escalate care. Currently two-thirds of units use an
203 ObsEWS that triggers when one or more markedly abnormal (red), or two or more mildly
204 abnormal (yellow), observations occur. Superficially, these systems appear different to those
205 based on aggregate weighted scoring systems. However, they can be considered aggregate
206 weighted scoring systems with a triggering value of 2 (if red observations score 2 points and
207 yellow score 1). Therefore, issues that require resolution are (i) agreement on the range of
208 weightings (i.e., 0-2 or 0-3), and (ii) the aggregate EWS at which care escalation occurs.
209 These questions can only be answered following collection and analysis of one or more large
210 databases of maternal observations and outcomes. The design of a suitable ObsEWS chart is
211 beyond the scope of our article.

212 The 2007 CEMACH report indicated that there was “...an urgent need for the routine
213 use of a national obstetric early warning chart, similar to those in use in other areas of
214 clinical practice...” and suggested an auditable standard for such a chart to be developed and
215 piloting started by the end of 2008.¹ The 2011 publication by the Maternal Critical Care
216 Working Group⁴ also recommended the introduction of a standard early warning system and
217 chart for obstetrics. These guidelines are currently being updated and are expected to
218 recommend the use of a standard ObsEWS incorporating six physiological parameters: RR,
219 S_pO₂, T, sBP, dBP, and HR.²⁸ These parameters would seem to have face validity because
220 they are almost identical to those previously recommended by anaesthetists⁹ and midwives.¹⁰

221 There is evidence that the majority of UK obstetric anaesthetists support the need for
222 a standardised, validated tool to prompt midwives and medical staff to summon help.^{8,9} The
223 benefits of standardising aspects of healthcare include reduced staff confusion and
224 misunderstanding, consistency in clinical decision-making, reduced error rate, improved
225 reliability, transferability across organisations and the opportunity for uniform staff
226 training.²⁹ Despite this and the validation of the CEMACH chart in 2012,¹³ there has been
227 little progress in getting universal agreement on systems for detecting maternal deterioration
228 in UK obstetric population. This may be because standardised systems are often perceived as

229 a challenge to professional autonomy and jurisdiction.²⁶ Midwives may be reluctant to adopt
230 ObsEWS, because they can see no inherent value.^{10,27} Midwives also felt that clinical
231 judgement was superior to the ObsEWS and that informing a doctor when the ObsEWS
232 recommended escalation was unnecessary, if the midwife believed that the woman was
233 well.²⁷ We found no evidence that maternal concern about their perceptions of being at risk
234 was included as a formal component of any ObsEWS triggering system.³⁰

235 The study has several strengths and weaknesses. It is the largest and most detailed
236 study of ObsEWS to date. Two researchers used a common, objective, systematic approach
237 to interrogate the early warning system charts independently, and analysis was not subject to
238 influence by participating centres. The assistance of the contributing units contacted was
239 essential. However, despite trying to contact leads/units multiple times, only 65.5% of units
240 provided charts and a few were unusable. In addition, not all maternity units in the UK and
241 Channel Islands are represented in the OAA database. Consequently, our data may be subject
242 to non-response and volunteer bias, implying that the results may not necessarily reflect the
243 actual use of ObsEWS in other centres. Nevertheless, the findings of variation in the design,
244 type and structure of vital signs charts, ObsEWS and escalation systems in the units studied
245 would be unchanged (other than in magnitude) by data from additional units.

246 There is a lack of consensus regarding the vital sign values used to reflect
247 physiological normality in ObsEWS used in consultant-led UK and Channel Island maternity
248 units. Improving agreement would facilitate the introduction of a standardised national
249 obstetric early warning chart, ObsEWS and escalation system, but this requires further
250 research. Standardisation would improve the equality of maternal care across units.

251

252 **Disclosure**

253 GBS was a co-developer of the VitalPAC clinical software system, a collaborative
254 development of The Learning Clinic Ltd (TLC) and Portsmouth Hospitals NHS Trust (PHT).
255 GBS was an employee of PHT until 31/03/2011. The VitalPAC software charts patient vital
256 sign measurements and provides decision support to bedside clinical staff regarding the need
257 for the escalation of care. GBS was a member of the following groups: Royal College of
258 Physicians of London's National Early Warning Score Development and Implementation
259 Group; National Institute for Health and Care Excellence Guideline Development Group on
260 'Acutely ill patients in hospital. Recognition of and response to acute illness in adults in
261 hospital'; National Patient Safety Agency Observatory group considering 'Deterioration not
262 recognised or not acted on'; Department of Health Emergency Care Strategy Team's

263 'Competencies for Recognising and Responding to Acutely Ill Patients in Hospital'; National
264 Cardiac Arrest Audit Steering Committee; Executive Committee of the Resuscitation Council
265 (UK); and the RC (UK) Immediate Life Support (ILS) course working group. GBS was also
266 a paid expert adviser to South Eastern HSC Trust concerning the Report of the Northern
267 Ireland Audit of Physiological Early Warning Scoring Systems (2010). GBS is a co-recipient
268 of an NIHR Health Service and Delivery Research grant into 'Nurse staffing levels, missed
269 vital signs observations and mortality in hospital wards'. GBS is the current President of the
270 International Society for Rapid Response Systems.

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274

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279 and associated escalation protocols necessary for the completion of the study.

280

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371

372 **Appendix A. Supplementary data**

373 Supplementary data associated with this article can be found in the online version at
374 <http://dx.doi.org/10.1016/j.ijoa.2017.xx.xxx>

375

376 **Table 1 Typical obstetric early warning score**

	3	2	1	0	1	2	3
Breathing rate (breaths/min)	<10			10-14	15-20	21-30	>30
SpO2 (%)	<94			>94			
Temperature (°C)		<35.0	35.0-35.9	36.0-38.0		>38.0	
Systolic blood pressure (mmHg)	<80	80-90	91-100	101-140	141-150	151-159	>160
Diastolic blood pressure (mmHg)				<90	91-100	101-110	>110
Heart rate (beats/min)	<40	41-50	51-60	61-100	101-110	111-130	>130
Level of consciousness				Alert	Responds to Voice	Responds to Pain	Unconscious

377

378 **Table 2 Vital signs and other related measurements used to trigger early warning system**
 379 **escalation**

	HR (beats/ min)	RR (breaths/ min)	sBP (mm Hg)	dBp (mm Hg)	mBP (mm Hg)	SpO ₂ (%)	T (°C)	AVP U	Use of O ₂	Urin e (mL/ h)	GCS
Number of discrete 'normal' ranges in use for each vital sign	16	14	21	15	2	12	7	2	-	-	-
Lowest value used in 'normal' range	40	8	80	40	0	90	35.0	A or V	-	-	-
Highest value used in 'normal' range	109	20	199	100	≤124	100	38.0	A	-	-	-
Most commonly used 'normal' range	50–99	11–20	100–149	≤89	≤124	95–100	36.0–37.9	A	-	>30	-
Number using most common range	62/120	64/120	59/120	88/117	6/7	59/112	74/119	109/112 (97.3%)	-	13/48 (27.1%)	1/1 (100%)
	(51.7%)	(53.3%)	(49.2%)	(75.2%)	(85.7%)	(52.7%)	(62.2%)				
Used as component of escalation system	120/120	120/120	120/120	117/120	7/120	112/120	119/120	112/120	8/120 (6.6%)	48/120 (40.0%)	1/120 (0.8%)
	(100%)	(100%)	(100%)	(97.5%)	(5.8%)	(93.3%)	(99.2%)	(93.3%)			

			(%)	(%)							
Recorded but not used	0/120	0/120	0/120	0/120	14/120	7/120	1/120	0/120	101/120 (84.2%)	55/120 (45.8%)	0/120 (0%)
	(0%)	(0%)	(0%)	(0%)	(11.7%)	(5.8%)	(0.8%)	(0%)			
Not recorded or used	0/120	0/120	0/120	3/120	99/120	1/120	0/120	8/120	11/120 (9.2%)	17/120 (14.2%)	119/120 (99.2%)
	(0%)	(0%)	(0%)	(2.5%)	(82.5%)	(0.8%)	(0%)	(6.7%)			

380 Data are number (%)
 381 HR, heart rate; RR, respiratory rate; sBP, systolic blood pressure; dBP, diastolic blood pressure; mBP,
 382 mean blood pressure; T, temperature; AVPU, (Alert-Voice-Pain-Unresponsive); GCS, Glasgow
 383 Coma Scale.
 384

385 **Table 3 Maternal symptoms and signs, and other clinical observations or measurements used as**
 386 **a component of obstetric early warning systems**

	Recorded on chart - used as component of triggering system	Recorded on chart - not used as component of triggering system	Not recorded on chart nor used as component of triggering system	Used as a component of aggregate EWS
Maternal pain score	76 (63.3%)	24 (20.0%)	20 (16.7%)	3 (2.5%)
Characteristics of lochia	68 (56.7%)	9 (7.5%)	43 (35.8%)	0
Proteinuria	65 (54.2%)	12 (10.0%)	43 (35.8%)	7 (5.8%)
Mother looks unwell	63 (52.5%)	0	57 (47.5%)	2 (1.7%)
Characteristics of amniotic fluid	47 (39.2%)	5 (4.2%)	68 (56.7%)	1 (0.8%)
Presence of nausea	13 (10.8%)	25 (20.8%)	82 (68.3%)	0
Drains/blood loss	12 (10.0%)	7 (5.8%)	101 (84.2%)	1 (0.8%)
Uterine tone	11 (9.2%)	6 (5.0%)	103 (85.8%)	0
Sedation level	3 (2.5%)	12 (10.0%)	105 (87.5%)	1 (0.8%)
Briskness of neuroreflexes	3 (2.5%)	7 (5.8%)	110 (91.7%)	0
Level of epidural-related motor block	3 (2.5%)	5 (4.2%)	112 (93.3%)	0
Level of epidural-related sensory block	2 (1.7%)	6 (5.0%)	112 (93.3%)	0
Maternal blood glucose level	2 (1.7%)	18 (15.0%)	100 (83.3%)	0

387 Data are number (%)

388

389 **IJOA 16-00229**

390 **Legends for figure**

391 **Fig. 1** Obstetric early warning chart described in the CEMACH report of 2007 (Reproduced
392 with permission of Dr.F Mcilveney, Forth Valley Royal Hospital)

393

ACCEPTED MANUSCRIPT

AN EXAMPLE OF AN OBSTETRIC EARLY WARNING CHART. REPRODUCED WITH THE KIND PERMISSION OF DR. FIONA MCILVENY (1)



OBSTETRIC EARLY WARNING CHART (FOR MATERNITY USE ONLY)

Name: _____

DOB: _____

Ward: _____

CONTACT DOCTOR FOR EARLY INTERVENTION IF PATIENT TRIGGERS ONE RED OR TWO YELLOW SCORES AT ANY ONE TIME

Date :														
Time :														
RESP (write rate in corresp. box)	>30													>30
	21-30													21-30
	11-20													11-20
	0-10													0-10
Saturations	95-100%													11-20
	<95%													95-100%
Administered O ₂ (L/min.)														%
Temp	39													39
	38													38
	37													37
	36													36
	35													35
HEART RATE	170													170
	160													160
	150													150
	140													140
	130													130
	120													120
	110													110
	100													100
	90													90
	80													80
	70													70
	60													60
	50													50
	40													40
	Systemic blood pressure	200												
190														190
180														180
170														170
160														160
150														150
140														140
130														130
120														120
110														110
100														100
90														90
80														80
70														70
60														60
50													50	
Diastolic blood pressure	130													130
	120													120
	110													110
	100													100
	90													90
	80													80
	70													70
	60													60
	50													50
	40													40
URINE	passed (Y/N)													passed (Y/N)
Proteinuria	protein ++													protein ++
	protein > ++													protein > ++
Amniotic fluid	Clear/Pink													Clear/Pink
	Green													Green
NEURO RESPONSE (✓)	Alert													Alert
	Voice													Voice
	Pain													Pain
	Unresponsive													Unresponsive
Pain Score (no.)	0-1													0-1
	2-3													2-3
Lochia	Normal													Normal
	Heavy / Fresh / Offensive													Heavy / Fresh / Offensive
Looks unwell	NO (✓)													YES (✓)
	YES (✓)													NO (✓)
Total Yellow Scores														
Total Red Scores														

Requests for copies of the original chart in MS Excel format may be made to Dr Fiona McIlveny at: Fiona.McIlveny@fvah.scot.nhs.uk

Reference

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394 **IJOA 16-00229**

395 **Highlights**

- 396 • Early warning systems used in UK consultant-led maternity units vary considerably
- 397 • Many different vital sign ranges are used to define normal maternal physiology
- 398 • Research is required to inform the normal vital sign ranges expected during pregnancy
- 399 • Obstetric early warning systems and charts should be standardised

400