The Development of the Adult Deterioration Detection System (ADDS) Chart

Report prepared for the Australian Commission on Safety and Quality in Health Care's program for Recognising and Responding to Clinical Deterioration

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Preface

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We thank David Collard (Information Division, Queensland Health) for adapting our draft versions of the Adult Deterioration Detection System (ADDS) charts into a desktop publishing format.

Contents

1. Background to the project

The Adult Deterioration Detection System (ADDS) observation chart described in this short report was developed as part of a research project carried out at The University of Queensland for Queensland Health and the Australian Commission on Safety and Quality in Health Care (ACSQHC). The aim of the project was to investigate the design and use of observation charts in recognising and managing patient deterioration, including the design and evaluation of a new adult observation chart that incorporated human factors principles.

Phase 1. Heuristic analysis of 25 observation charts

The initial phase of the project was a systematic usability evaluation of the quality and extent of design problems in 25 existing observation charts (1). A total of 1,189 usability problems were identified in the observation charts. Usability problems were identified as affecting the observation charts' page layout, information layout, recording of vital signs, integration of track and trigger systems, language and labelling, cognitive and memory load, use of fonts, use of colour, photocopying legibility, and night-time legibility. In compiling lists of the various usability problems present in the observation charts, principles for producing a better designed observation chart were developed (see Section 3) (1).

Phase 2. Online survey of health professionals

Using the information obtained from the heuristic analysis, the new ADDS chart was designed by combining what were considered to be the best design features of existing charts. The ADDS chart was then included in an online survey of health professionals' opinions regarding observation charts (2). As part of the survey, participants (N = 333) were asked to respond to 13 statements regarding the design of one of nine randomly assigned observation charts. The nine observation charts included the ADDS chart and eight observation charts of "good", "average", or "poor" design quality from the heuristic analysis. There was a statistically significant effect of chart type on the aggregated rating. Charts 7, 8, and 9 (collectively, the *a priori* "poor" quality charts) were each rated as having a significantly poorer design compared to each of the other charts (collectively, the *a priori* "average" and "good" quality charts).

As a result of collecting data regarding the preferences of participants in the online survey, we made some changes to the terms used in new ADDS chart. We changed 'O_2 Delivery' to 'O_2 Flow Rate', as 'O_2 Flow Rate' was the second most popular term after 'O_2 LPM' for that observation (we did not include 'O_2 LPM' as this would introduce a new and unnecessary abbreviation into the chart). We changed 'Urine for 4 Hours' to '4 Hour Urine Output' as it was the most popular term for that vital sign. We also changed 'Pulse' to 'Heart Rate' as the combined preferences for 'Heart Rate', 'HR', and 'H.R.' eclipsed those for 'Pulse' and 'P' (we did not include the single most popular term, 'HR', as this would introduce an unnecessary abbreviation into the chart). We kept other terms unchanged on

the ADDS chart as we generally preferenced using the full word over more popular abbreviations (i.e. 'Temperature', not 'Temp').

Responses to other sections of the online survey also suggested that we not modify the overall design of the ADDS chart. First, participants expressed a preference for "*plotting the value* [for a vital sign] *on a graph with graded colouring, where the colours correspond to a scoring system or graded responses for abnormality*" for both recording observations and detecting patient deterioration. All of the ADDS chart's vital signs are plotted in this manner (except blood pressure [BP] on one version of the chart, for which users have to consult a look-up table). Second, participants' aggregated rating for the ADDS chart was no worse than that of any other chart (and significantly better than that of the "poor" quality charts), even though the ADDS chart could be argued to be radically different from many existing observation charts that participants may be familiar with.

Phase 3. Behavioural experiments

Detecting abnormal vital signs experiment

This study involved an empirical comparison of six charts (two versions of the ADDS chart and four existing observation charts of "good", "average", or "poor" design quality) (3). Chart novices and health professionals (doctors and nurses) were recruited as participants. Each chart design was shown to each participant four times displaying different physiological data with one abnormal vital sign (e.g. a high systolic blood pressure), and four times displaying different normal physiological data. Participants had to classify the physiological data on the charts as "normal" or "abnormal" (after memorising the normal ranges for each vital sign). Error rates and response times were measured.

Chart design was found to have a statistically significant effect on both error rates and response time, with the charts identified as having better design tending to yield fewer errors and shorter decision times. Specifically, the two versions of the ADDS chart outperformed all the existing charts on both metrics, where the other charts yielded between 2.5 and 3.3 times the number of errors as the ADDS chart.

Recording patient data experiment

Again, this study involved an empirical comparison of six charts (two versions of the ADDS chart and four existing observation charts of "good", "average", or "poor" design quality) (4). Chart novices and health professionals were recruited as participants to record patient data onto the six charts in a simulated ward environment. Error rate was the main outcome of interest.

Chart design was found to have a statistically significant effect on the numbers of errors committed while recording patient data, indicating that chart design influenced performance. The rank order of charts in terms of error rates was completely different from that in the previous experiment, where the best-performing chart in the current study (the "poor" design quality chart) was the worst-performing chart in the previous study, and the ADDS charts were ranked in fourth and fifth place rather than first and second place. This was presumably because the task of recording data onto the "poor" chart simply involved the transposing of numbers directly from the simulated vital signs

display onto the chart. However, the error rates were substantially smaller than those found in the first experiment (0.2% to 2% errors vs. 10% to 33% errors, respectively).

For the three charts that included multiple parameter track and trigger systems (the two versions of the ADDS chart and one of the existing "good" design-quality charts), there was the opportunity for participants to make additional errors when scoring these systems. The existing "good" chart performed significantly worse than the ADDS chart without the Systolic BP table but otherwise there were no significant differences between the charts for this measure.

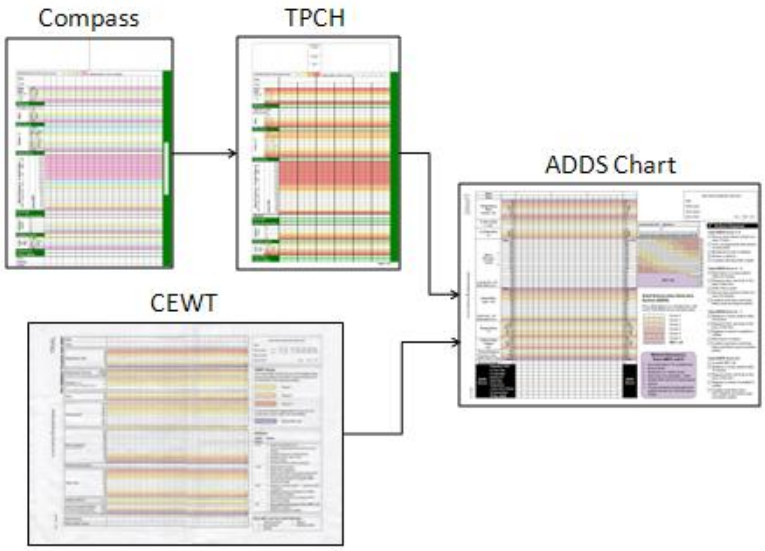
At the end of the experiment, participants were asked to nominate the chart that they liked using the best. Both groups of participants appeared to prefer the ADDS chart (especially the ADDS chart without the Systolic BP table) to the other charts, despite this chart being associated with higher data-recording errors than some of the existing charts. This would seem to suggest that individuals were taking more account of the ease of interpreting the data (at which the ADDS charts outperformed the other charts in the previous experiment), rather than the ease of recording data.

2. Adult Deterioration Detection System (ADDS) chart

2.1 Resources used to design the ADDS Chart

The ADDS chart was largely based on:

1. The Prince Charles Hospital's (TPCH, Brisbane, Queensland) General Observation Chart, which in turn was based on:
    - The Canberra Hospital's (Australian Capital Territory) Compass General Obervation Chart
2. The Children's Early Warning Tool (CEWT) paedriatric chart developed at Royal Children's Hospital (Brisbane, Queensland)



A Clincial Forms Design Officer (Information Division, Queensland Health) assessed drafts of the ADDS chart for compliance with the relevant standards (e.g. Queensland Health's Clinical Form Design Standard Guidelines) (5).

The chart was developed according the usability principles specific to paper-based observation charts that were developed in the heuristic analysis (listed in Appendix B of that report and reproduced in Section 3 of this report) (1).

2.2 Rationale for the design of the ADDS chart

The ADDS chart was designed with the very specific aim of being a tool to detect patient deterioration, rather than being an all-encompassing general observation chart. Given that the project brief was to produce an evidence-based observation chart that prompted the recognition and appropriate management of patient deterioration, the focus on the chart was on presenting the **most important vital signs for detecting deterioration in most patients** in a user-friendly manner. We avoided the temptation to include additional observations as, from a human factors perspective, every additional piece of information included could potentially compete with the existing (and, presumably, more important) information for the user's attention.

2.3 Design features of the ADDS chart

The ADDS chart and incorporated the following features designed to minimise the design problems that might lead to human error in both recording and interpreting patient observations.

Page layout

- Only one mention of the facility name, relegated to the outside pages of the chart. The facility name is among the least important features of an observation chart with regards to detecting patient deterioration.
- Only one instance of vertically-oriented text (see Figure 1). Vertically-oriented text takes longer for a user to read (6).

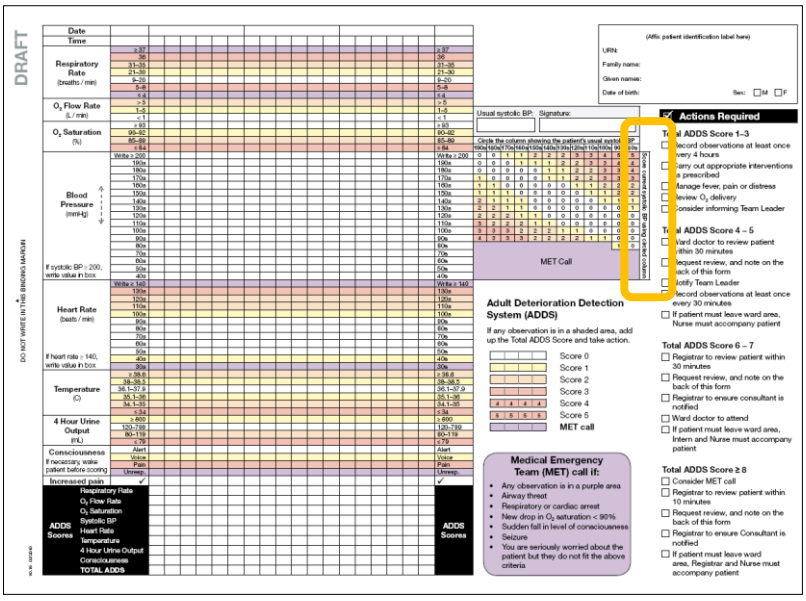


Figure 1. Yellow oval highlights the instance of vertically-oriented text

Information layout

- Information was displayed in decreasing order of importance. The most critical vital signs (e.g. Respiratory Rate) were placed towards the top-left of the page, as this is where users would look first (see Figure 2). Most existing charts did not follow this practice (1).

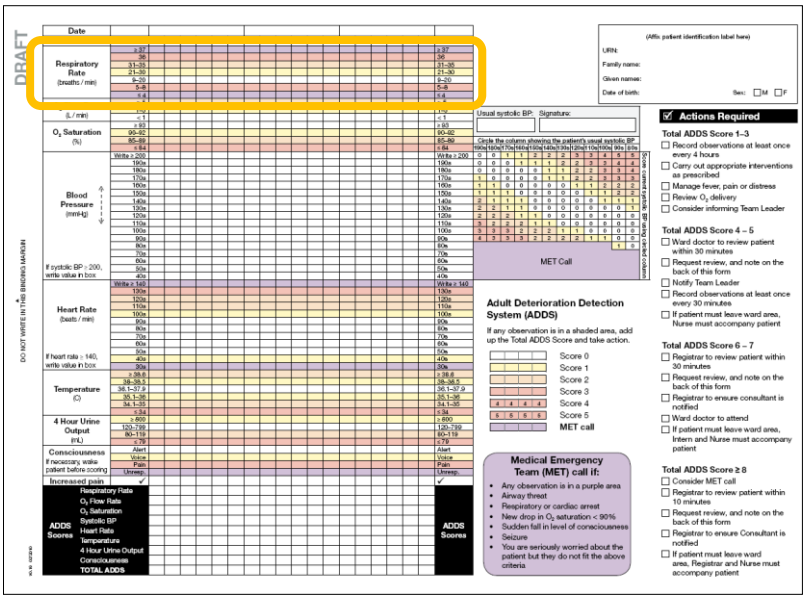


Figure 2. Yellow rectangle highlights Respiratory Rate being placed towards the top-left of the page

- Nine vital signs (Respiratory Rate, O_2 Flow Rate, O_2 Saturation, Blood Pressure, Heart Rate, Temperature, 4 Hour Urine Output, Consciousness, Increased Pain) are recorded on one half of an A3 page.
- No irrelevant information is present on the inside pages of the chart (e.g. facility name, Queensland Health logo, etc.). By 'irrelevant information' we mean information irrelevant to detecting patient deterioration.

- Bold horizontal lines between vital signs provide visual separation between otherwise adjoining vital signs (see Figure 3).

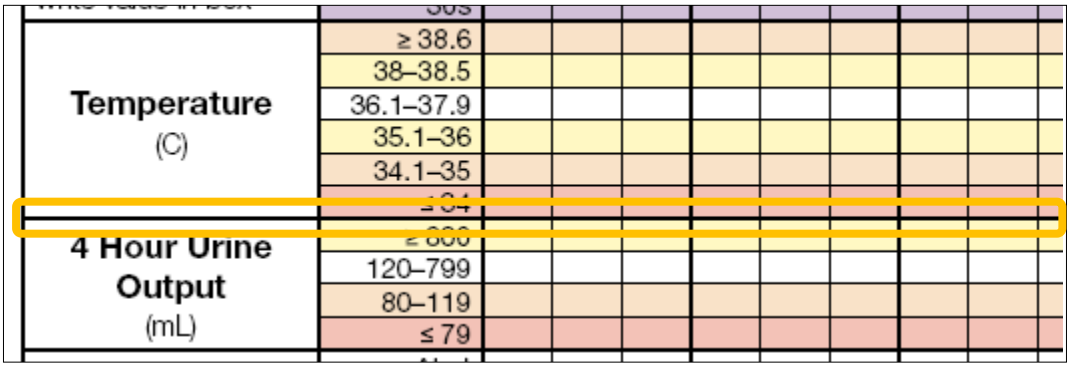


Figure 3. Yellow rectangle highlights bold horizontal line used to separate vital signs

- Areas for writing text accommodate size 14 font (e.g., the Systolic BP table and the outside pages of the chart).
- Labels of the same level of importance are formatted the same, e.g. all the vital signs' labels are formatted the same, and all the ADDS Scores labels are formatted the same.
- Chart can be used for 3 days (assuming 4-hourly monitoring). The average length of stay in hospital is 3.3 days, based on the most recent Australian statistics (7). The "National Consensus Statement: Essential Elements for Recognising and Responding to Clinical Deterioration" produced by the Australian Commission for Safety and Quality in Health Care (hereafter referred to as the Consensus Statement) states that for the majority of patients observations should be taken at least once per 8 hour shift (8).

Recording observations

- Only vital signs considered to be the most important for detecting deterioration were included on the chart. If additional information was included, this extra information would potentially compete with the existing information for a user's attention.
- The vital signs included in the chart include all of the physiological observations recommended in the Consensus Statement (8): respiratory rate, oxygen saturation, heart rate, blood pressure, temperature, and level of consciousness. Urine output was also included as it contributes to the ADDS score (note that urine output was present on the Compass/TPCH charts and was part of their scoring system, which was the basis for the ADDS scoring system). Oxygen flow rate was included as it may indicate deterioration in the respiratory system when oxygen saturation is still in the normal range (e.g. when the patient is receiving increasing amounts of oxygen to maintain their oxygen saturation). Note that this indicator was sourced from the CEWT chart. Pain was included because unrelenting pain has been implicated in several cases of undetected patient deterioration.
- Each vital sign was presented as a separate graph (see Figure 4). Many existing charts either displayed data numerically (making it difficult to see data trends, and hence making deterioration harder to detect) or included graphs with multiple vital signs plotted on the same graph area (this increased visual clutter which could make deterioration harder to detect). The Consensus Statement (8) states that observation charts should display information in a graphical format.

- Terms used for each vital sign were selected in part based on the preferences given by a large sample of health professionals in the online survey. Each label also specifies the unit of measurement, e.g. Temperature (C), and is formatted differently from the corresponding scale (i.e. larger font size and bold font).

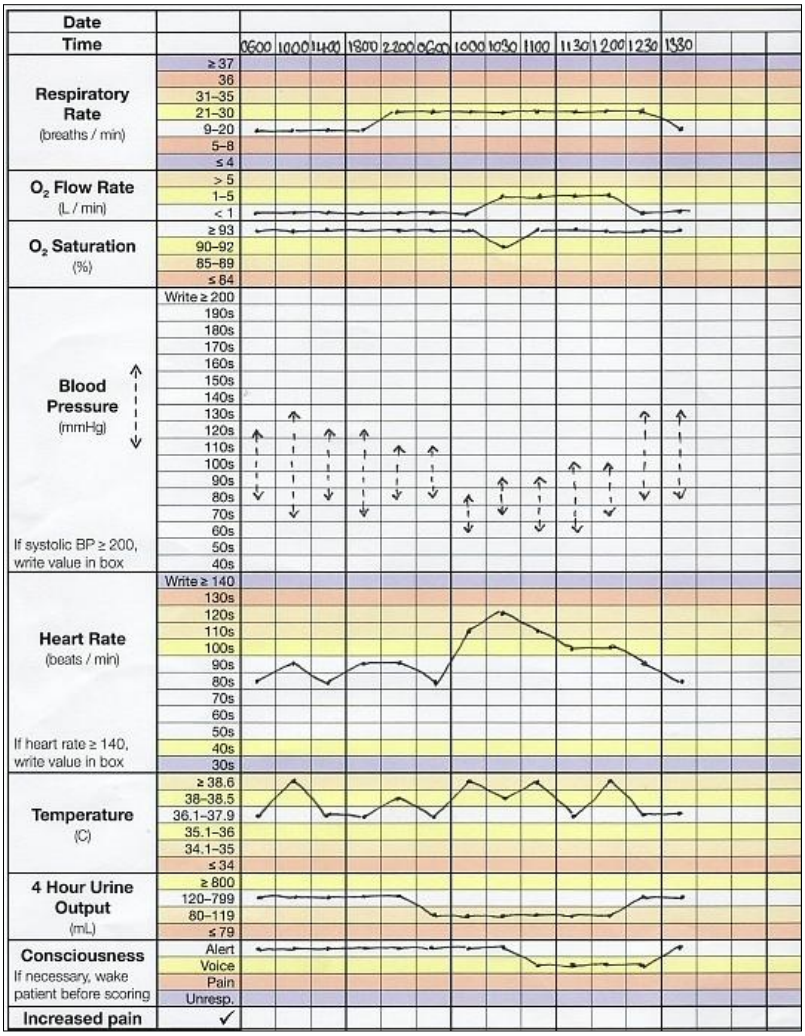


Figure 4. Each vital sign is presented as a separate graph

- Scales were provided on both the left and right of each graph (see Figure 5) and bold vertical lines were placed every 3 columns (see Figure 6). These features were designed to minimise the chance of users entering data in or reading data from the wrong column or row. Scales being present on both the left and right of each graph also helps left-handed users to record observations without their hand covering the scale.

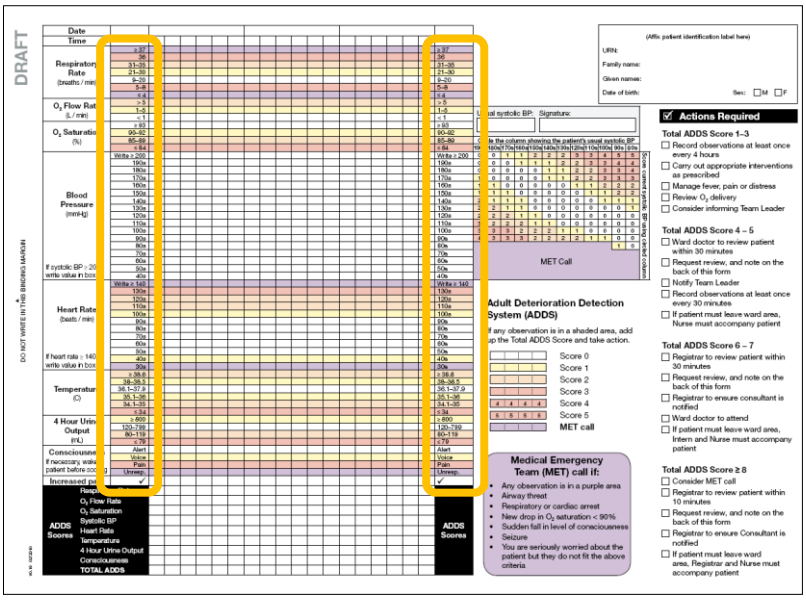


Figure 5. Yellow rectangle highlights scales on the left and right of each graph

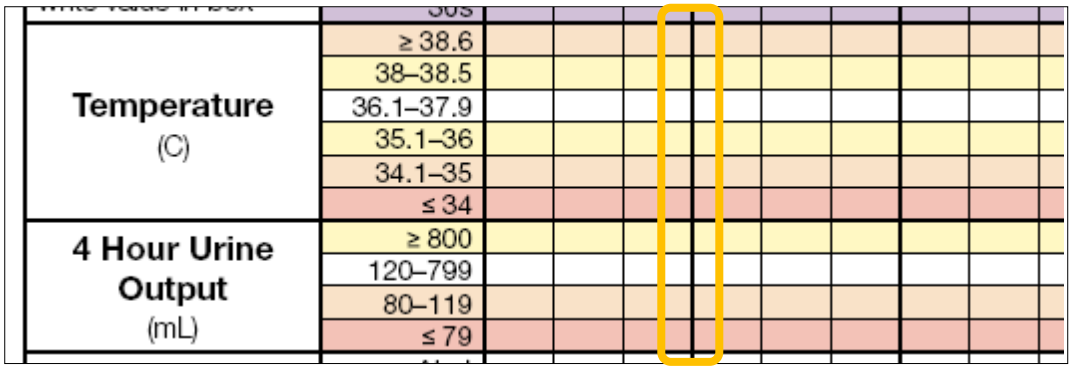


Figure 6. Yellow rectangle highlights bold vertical line used to prevent column shift

- Values within the scale for each vital sign are mutually exclusive.
- Consciousness is measured using the AVPU scale (see Figure 7). The AVPU scale seemed to be a simpler, less subjective, more behavioural measure of consciousness than other measures (such as 'Sedation Scores', which involve assigning descriptors such as "mild", "moderate", etc.). The AVPU scale's validity is supported by the finding that each AVPU category corresponds to a restricted range of Glasgow Coma Scale scores (9, 10).

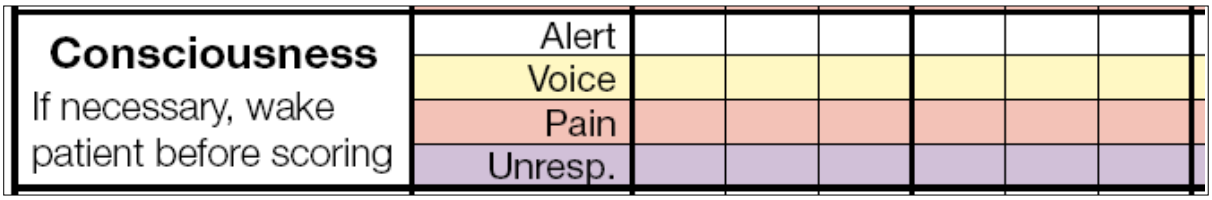


Figure 7. AVPU scale for measuring a patient's level of consciousness

- We created two versions of the ADDS charts. The first version included a Systolic BP table to allow the patient's usual systolic blood pressure to be taken into account when deciding the scoring thresholds for this vital sign (see Appendix A for how to use the Systolic BP table).

This was based on tables included in the Compass and TPCH charts. The second version did not have this table; instead, the scoring thesholds were based on the assumption that the patient's usual systolic blood pressure was 120 mmHg. The second version was potentially simpler to read than the first version, but the first version was likely to yield a more accurate decision as to whether a patient's blood pressure was abnormal or not.

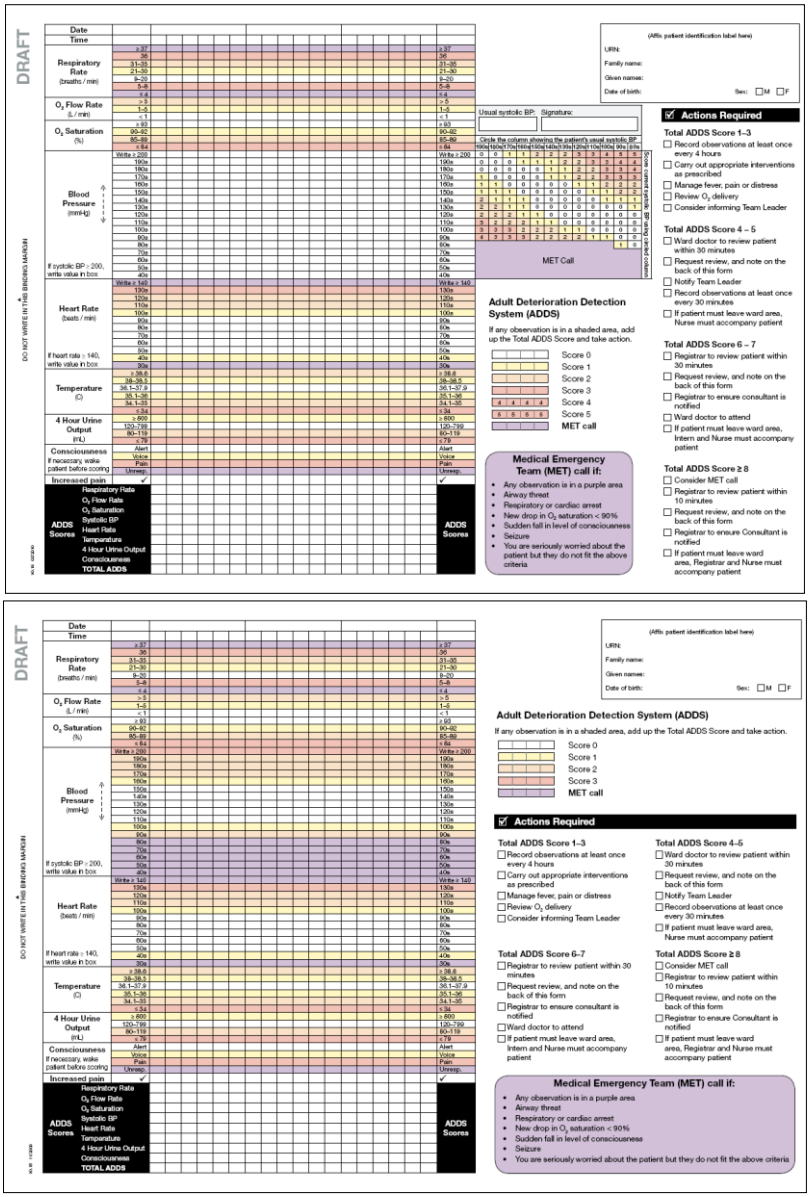


Figure 8. Two versions of the ADDS chart, the top panel shows the version that included a Systolic BP table and the bottom panel shows the version in which blood pressure is in the same manner as the other vital signs

Track and trigger systems

- The Consensus Statement (8) states that observation charts should include a system for tracking changes in vital signs over time (i.e. thresholds for each individual vital sign or a system for combining individual thresholds). Consistent with this, the ADDS chart integrated both a single parameter (MET criteria) and a multiple parameter (ADDS scores) colour-coded track and trigger system to facilitate the detection of deterioration (note that the Consensus Statement did not specify what type of system should be used). The scoring system values

and cut-off scores used in the ADDS chart were based on those used in the Compass and TPCH charts and should be regarded as placeholders and subject to clinical review (especially as oxygen flow was not included as part of these systems).

- The single parameter system (in which a emergency response was required when any single observation was outside a given range) has the advantage of simplicity of use (see Figure 9). The multiple parameter system (in which vital signs were scored using a colour-coded key and scores were summed to give an overall indication of the patient's condition) is potentially more sensitive to deterioration and could lead to earlier detection of deterioration or fewer false alarms (see Figure 10).
- **How can the multiple parameter system potentially lead to earlier detection of deterioration as well as fewer false alarms than single parameter systems?** As with any situation which requires the discrimination of a signal (in this case, a deteriorating patient) from noise (a patient who is not deteriorating), it is useful to apply signal detection theory to understand how different track and trigger systems using different cut-offs might affect outcomes. If we created two charts with the same track and trigger system but altered vital sign thresholds then the two charts would yield different rates of correct identifications of deterioration. However the false alarm rates would vary monotonically with correct identification rate, such that the chart with higher rates of correct identifications would also have a higher rate of false alarms. By only changing cut-off ranges, we are not varying the overall ability of the system to tell apart deteriorating and non-deteriorating patients; we are just varying the threshold of classification of patients into deteriorating or non-deteriorating groups. However, if we compare two different track and trigger systems that use different mechanisms for detecting deterioration (e.g. single versus multiple-parameter) then there is the opportunity for the overall discriminatory power to differ. This means that it is possible that one system could have both a higher rate of correct identifications of deterioration and a lower rate of false alarms than another system. The multiple parameter system has the potential to have greater overall discriminatory power than a single parameter system because it involves aggregating information across vital signs (where vital signs seldom change independent of one another). This means it can potentially pick up more subtle but genuine patterns of deterioration (deterioration apparent when multiple vital signs are observed together but not apparent when vital signs are observed in isolation). Hence it could potentially result in greater detection rates and fewer false alarms than a single parameter system. However, this proposal is a theoretical claim and one that has not yet been convincingly verified or refuted by empirical work. As a result, we have included both types of track and trigger systems in the ADDS chart given they are not mutually exclusive.
- A staff member's "serious worry" about a patient is included as a MET criterion (see Figure 9). This is consistent with the Consensus Statement (8) regarding escalation of care for clinical deterioration.
- The colour-coded key for the multiple parameter system is as close as possible to the vital signs area (see Figure 10).

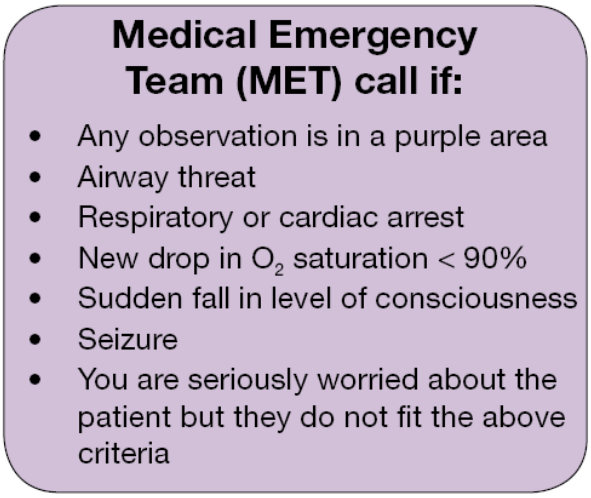


Figure 9.The single parameter track and trigger system (MET criteria)

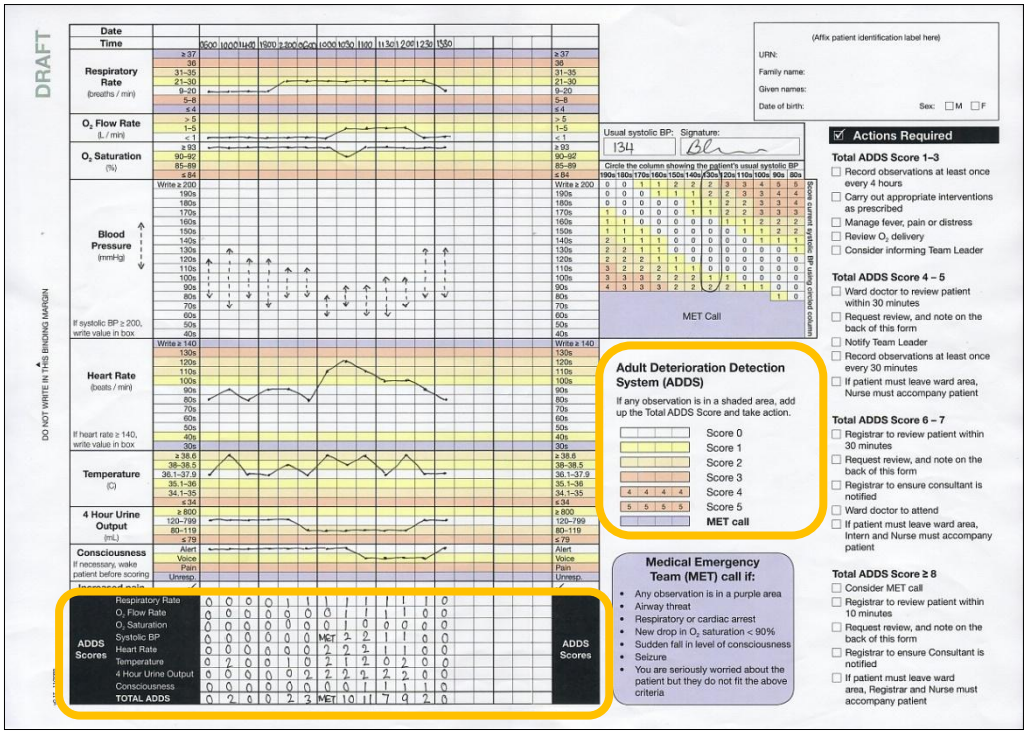


Figure 10. The multiple parameter track and trigger system (ADDS Scores)

- There is space to record modifications to vital sign thresholds (see Figure 11). This information was placed so that it would be in view when a user first picked up the chart. This is consistent with the Consensus Statement (8), in which it is stated that observation charts should include space to document the normal physiological range for the patient.

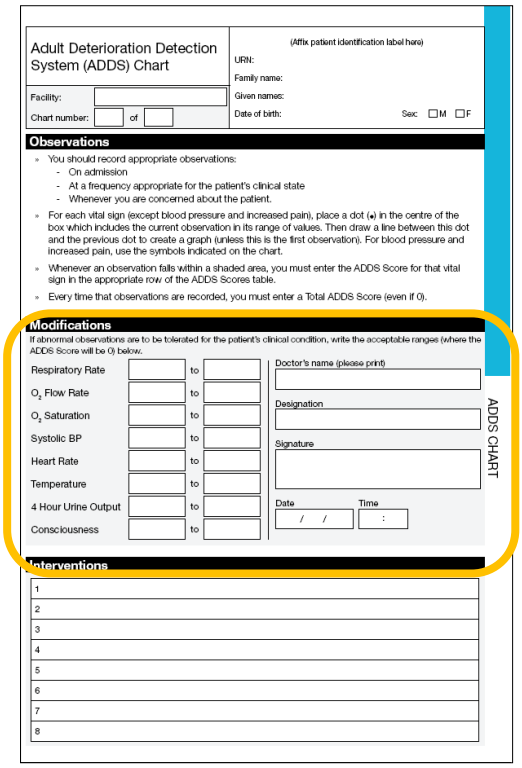


Figure 11. Area for recording modifications to the vital sign thresholds

- The list of actions required in response to certain total score ranges is listed on the same side of the chart as the vital signs and the ADDS scores (i.e. no page-turning required). The instructions are intended to be clear and descriptive (see Figure 12). Checkboxes were used as bullet-points for the lists, so that users can even tick the boxes as they complete certain actions. This is consistent with the Consensus Statement (8), in which it is stated that observation charts should include information about the action required when thresholds for abnormality are reached. However, it should be noted that all documented actions in the ADDS chart should be regarded as no more than placeholders: it would be expected that the list of actions would be adapted according to local circumstances.

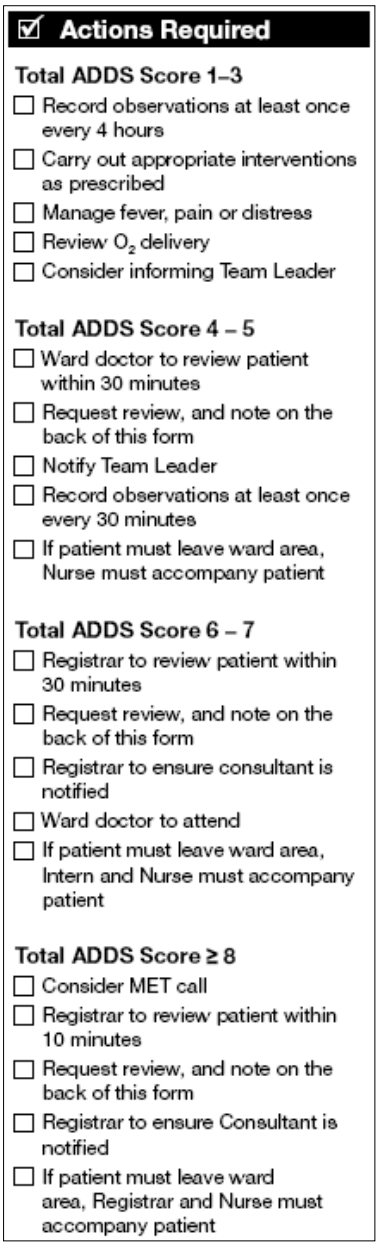


Figure 12. Actions required

Cognitive and memory load

- All information normally required to use the system (for example, the colour-coded key, the MET criteria, and the actions to be taken when different levels of deterioration were detected) is provided on the same page as the vital signs data (see Figure 13). This was in order to reduce cognitive load (e.g. to avoid the user having to hold vital sign data in memory, while turning the page to access further information).

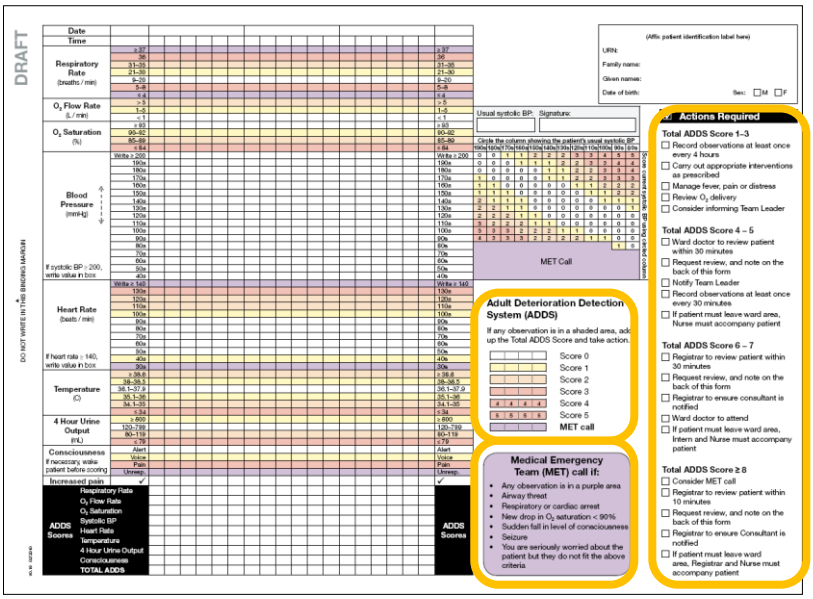


Figure 13. Colour-coded key, the MET criteria, and actions recquired list are all provided on the same page

- The chart requires the following simple actions from the user:
  - Recording of the observation for each vital sign
  - Checking whether any vital signs trigger a MET call
  - Transformation of the observation into an ADDS score (based on the row colour or consulting the Systolic BP table)
  - Calculation of the total ADDS score
  - Comparison of the total ADDS score to the Actions Required list

Language and labelling

- Terms and abbreviations used on the chart were selected in part based on the preferences given by a large sample of health professionals in the online survey.
- The chart only contains 14 unique abbreviations (ADDS, BP, C, ENT, F, L, M, MET, min, mL, mmHg, O_2, Unresp., URN). The average number of unique abbreviations (i.e. discounting repetitions of the same abbreviation) in a chart included in the heuristic analysis was 19, and the maximum was 51 (1). Of the 14 unique abbreviations in the ADDS chart, two are defined in the chart itself (i.e., ADDS and MET), four are internationally recognised standard abbreviations for units of measurement, one is the standard abbreviation for oxygen, and one was the abbreviation preferred by health professionals in the online survey (i.e. BP).

Font

- All text is in HelveticaNeue font.
- The font used does not have serifs, as serifs slow the reading of short pieces of text (11). Similarly, the font used is not compressed, as crowding the letters within words slows reading (12, 13).
- Capitalisation is used infrequently, as capitalised text takes 10% more time to read than upper and lower case text (12, 14).

Colour

- Chart colours were chosen such that colour density is correlated with the extent to which a patient's vital signs are outside the normal range (apart from being an intuitive progression, this strategy aids colour-blind users).
- A red-green colour-blind individual was able to differentiate the colours that we chose.

3. Usability Principles Used to Develop the ADDS Chart with the Rationale for Their Use Explained

This section is taken from Appendix B of the heuristic analysis report (1).

Each usability principle specific to paper-based observation charts that was used in the current project is listed below. In order to be relatively concise, only the most applicable rationales (adapted from the more general published usability principles listed in Section 2.2 of the heuristic analysis report) are listed for each usability principle. For some principles related to formatting (page margin size, pastel colouring, and font size), Queensland Health's Clinical Form Design Standard Guidelines were used (5).

Usability principle	Rationale
Page layout	
Minimal space should be used for hospital name or logo	The system should not contain information that is rarely needed
Bureaucratic codes that do not relate to the chart's clinical usage should not be present	The system should not contain information that is rarely needed
Landscape orientation preferred	Increases the size of the display that a user can simultaneously attend to
Page margins should be: left 2 cm, all others 1 cm	Queensland Health's Clinical Form Design Standard Guidelines
Should not have mixture of vertically-oriented & horizontally-oriented data points	The system's graphic design & colour should be carefully considered – chart should not have to be turned during use & vertically-oriented text takes longer to read (6)
Page should be A4 size if possible	The system should match the user's task in as natural a way as possible
Information layout	
Information should be displayed in decreasing order of importance	Information presented in the top left of a display normally gets more attention
Eight vital signs should all be on 1 side of a page	The aim of any system should be to present exactly the information the user needs at exactly the time & place that it is needed
No redundant or irrelevant information	The system should not contain information that is rarely needed
Two vital signs or track & trigger scores should be clearly separated	Avoid unrelated elements being formatted in a such a way that they seem to belong together
Areas for writing should accommodate 14 point font	Queensland Health's Clinical Form Design Standard Guidelines
Amount of space devoted to something should not be too big	The system should not contain information that is rarely needed
Labels of the same level of importance should be formatted the same	Avoid related elements being formatted in a such a way that they seem to belong to different categories

Enough time-points for chart to be used for 3 days (assuming 4-hourly monitoring)	The system should match the user's task in as natural a way as possible (i.e. average length of stay in hospital = 3.3 days) (7)
Important information should be displayed in top left of page	Information presented in the top left of a display normally gets more attention
Basic functionality should be understandable in 1 hour	Basic functionality should be understandable in 1 hour
Recording vital signs	
Data points for 2 vital signs should not be able to be confused	The system should produce minimal errors
Labels should specify unit of measurement	The aim of any system should be to present exactly the information the user needs at exactly the time and place that it is needed
Labels should be clear & descriptive	The system should have a good match between the display of information and the user's mental model of the information
Graph should not be too small or cramped	The system's graphic design and colour should be carefully considered – smaller or cramped graphs may be less legible (i.e. trends flattened)
Thick vertical lines should be placed every 3-4 columns	Reduce the time spent assimilating raw data
Time boxes should accommodate 14 point font	Queensland Health's Clinical Form Design Standard Guidelines
Date boxes should accommodate 14 point font	Queensland Health's Clinical Form Design Standard Guidelines
Information should be displayed as a graph	Bring together lower level data into a higher-level summation
Vertical axis of a graph should be labelled on the left & right of the page	Reduce the time spent assimilating raw data
Labels should provide an example of how data are to be recorded	When users are asked to provide input, the system should describe the required format and, if possible, provide an example
More than 1 vital sign should not be recorded on the same graph or area	The system should produce minimal errors
Graph label formatting should differ from vertical axis values' formatting	The system's graphic design and colour should be carefully considered – graph label should stand out from the graph values
Scale of the vertical axis values should not change	Reduce the time spent assimilating raw data
Vertical axis values should not be misaligned	The system should produce minimal errors
Date should be ruled off every 24 hours	Reduce the time spent assimilating raw data
Chart should not require the use of different coloured pens	Reduce the time spent assimilating raw data
Vertical axis values should be mutually exclusive	The system should produce minimal errors
Labels should not be written vertically with upright letters	The system's graphic design and colour should be carefully considered - vertically-oriented text takes longer to read (6)

Integration of track and trigger systems	
Action instructions should be clear & descriptive	Messages should be phrased in clear language and avoid obscure codes (the user should not have to refer to elsewhere, e.g. the manual). Messages should help the user solve the problem
Chart should include a track & trigger system	Bring together lower level data into a higher-level summation if appropriate
Scoring guide for each vital sign should not be listed on another part of the chart	Users should not have to remember information from one part of the system to another (i.e. avoid mental comparisons)
Action guide for the total score should not be listed on another part of the chart	Users should not have to remember information from one part of the system to another (i.e. avoid mental comparisons)
System should allow for modification of the threshold scores for a particular patient	The system should match the user's task in as natural a way as possible
System should be multiple parameter or aggregated weighted scoring	Bring together lower level data into a higher-level summation if appropriate
Colour scheme should correspond to the system	Automate unwanted workload. The system should allow the user to rely on recognition rather than recall memory
Score for each vital sign should be recorded beside the vital sign itself	Information that will be used together should be displayed close together
Basic functionality should be understandable in 1 hour	Basic functionality should be understandable in 1 hour
Language and labelling	
Expressions should be clear	Words, phrases, and concepts used should be familiar to the user. Users should not have to wonder whether different words or actions mean the same thing
Abbreviations should not be able to be misinterpreted	Words, phrases, and concepts used should be familiar to the user
No spelling or grammatical errors	Words, phrases, and concepts used should be familiar to the user
Australian English spelling	Words, phrases, and concepts used should be familiar to the user
Cognitive and memory load	
Information should not need to be compared over different areas of the 1 page	Users should not have to remember information from one part of the system to another (i.e. avoid mental comparisons)
Writing should not be required when chart could provide response options to circle	The system should allow the user to rely on recognition rather than recall memory
Information should not need to be transcribed or compared over 2 pages	Users should not have to remember information from one part of the system to another (i.e. avoid mental comparisons)
Use of fonts	
Text no smaller than 11 point font	The system's graphic design and colour should be carefully considered – 10 point font can be less legible (15)
Ohs/zero or els/one should not look very similar	Users should not have to wonder whether different words or actions mean the same thing

Capitalisation should be used sparingly	Avoid over-using upper-case text, it attracts attention, but is slower to read than mixed-case text (12, 14)
Text size should not be misleading (e.g. important information very small & vice versa)	The system should have a good match between the display of information and the user's mental model of the information.
Should not use more than 1 font type	The system's graphic design and colour should be carefully considered – may slow reading as user must 'switch' between fonts
Should not use compressed font (e.g. Arial Narrow)	The system's graphic design and colour should be carefully considered – crowding the letters in words slow reading (12, 13)
Text should not be too big	The system's graphic design and colour should be carefully considered – larger fonts (12 & 14 point) can be less legible (16)
Serifs should not be used	The system's graphic design and colour should be carefully considered – serifs slow reading of short pieces of text (11)
Use of colour	
Colour should be used in a meaningful way	Reduce the time spent assimilating raw data
Colours should be distinguishable to colour-blind users	If colour is to be used, the system requires redundant cues so that colour-blind users are able to use the system with ease
Redundant cues should be included, i.e. scheme can be used without the colours	If colour is to be used, the system requires redundant cues so that colour-blind users are able to use the system with ease
Pastel colours preferred	Queensland Health's Clinical Form Design Standard Guidelines
Should not be more than 5 colours in chart as a whole (including white space, text, logos)	Adapted from: avoid more than 7 colours (on a webpage), or the display will look too "busy"
Colour choice should not be potentially deceptive (e.g. green = bad)	The system should have a good match between the display of information and the user's mental model of the information
Should not be more than 5 colours in vital signs' area (including white space)	Adapted from: avoid more than 7 colours (on a webpage), or the display will look too "busy"
Photocopying legibility	
Chart should be reproduced legibly at a range of photocopier settings, especially vital signs' data and labels	The system should match the user's task in as natural a way as possible
Low light legibility	
Chart should be legible in realistic low-light levels	The system should match the user's task in as natural a way as possible

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References

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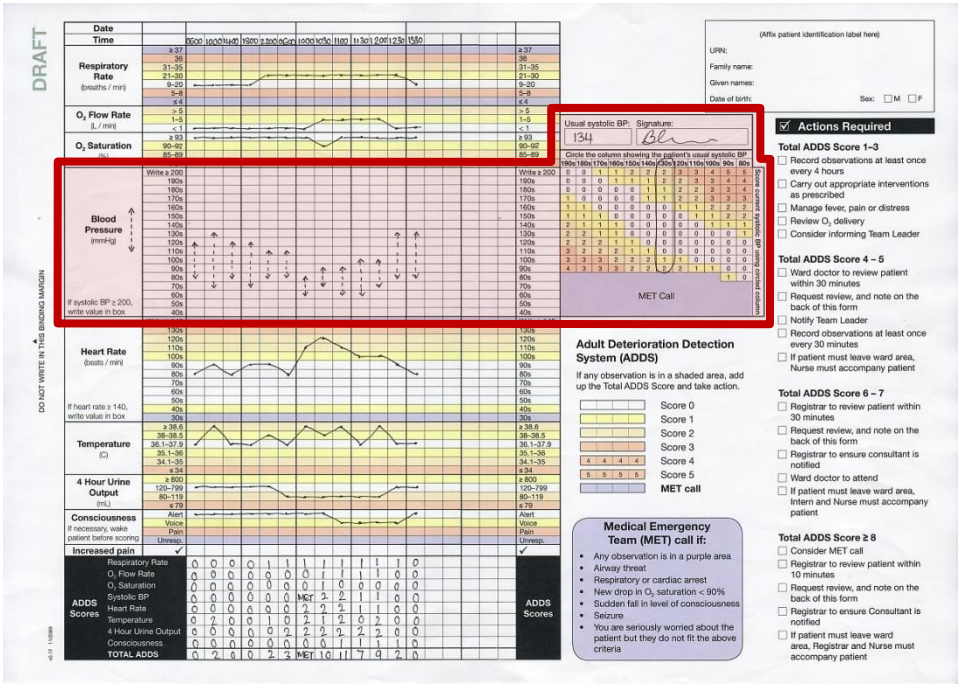
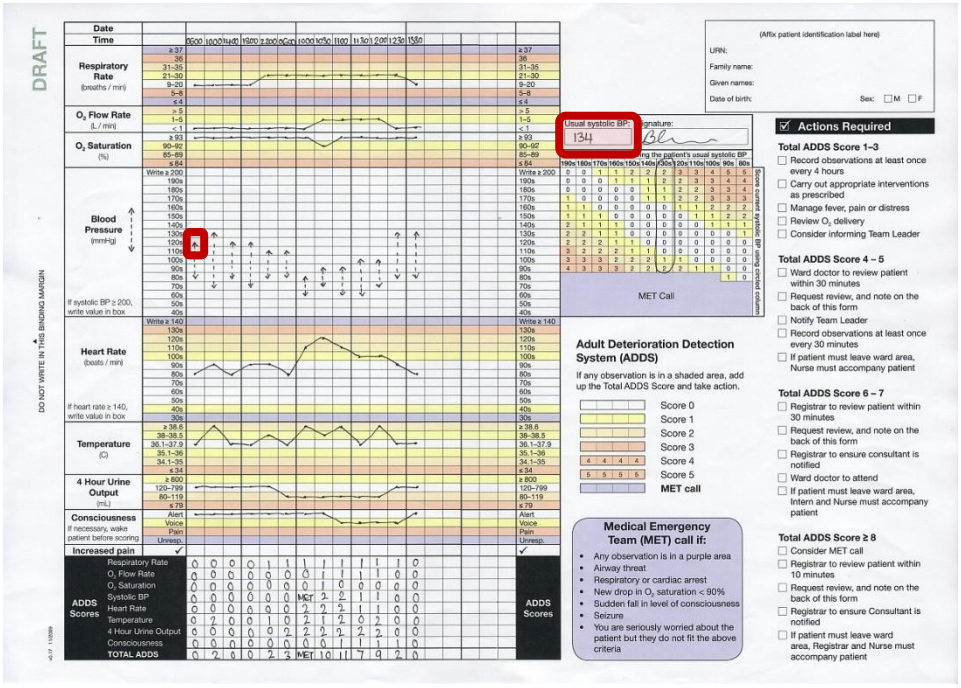
Appendix A: How to use the Systolic BP table

1.



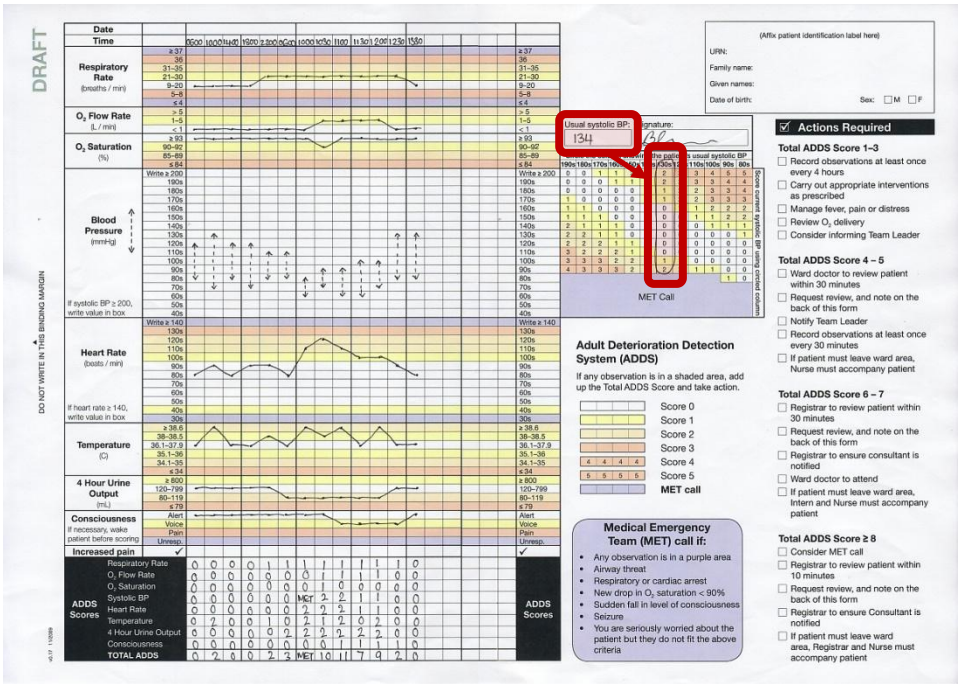
Blood pressure observations are plotted on a “blank” graph area. To score blood pressure, you have to input the patient’s current systolic blood pressure and the patient’s usual systolic blood pressure in to the Systolic BP scoring table on the right-hand-side of the page.

2.



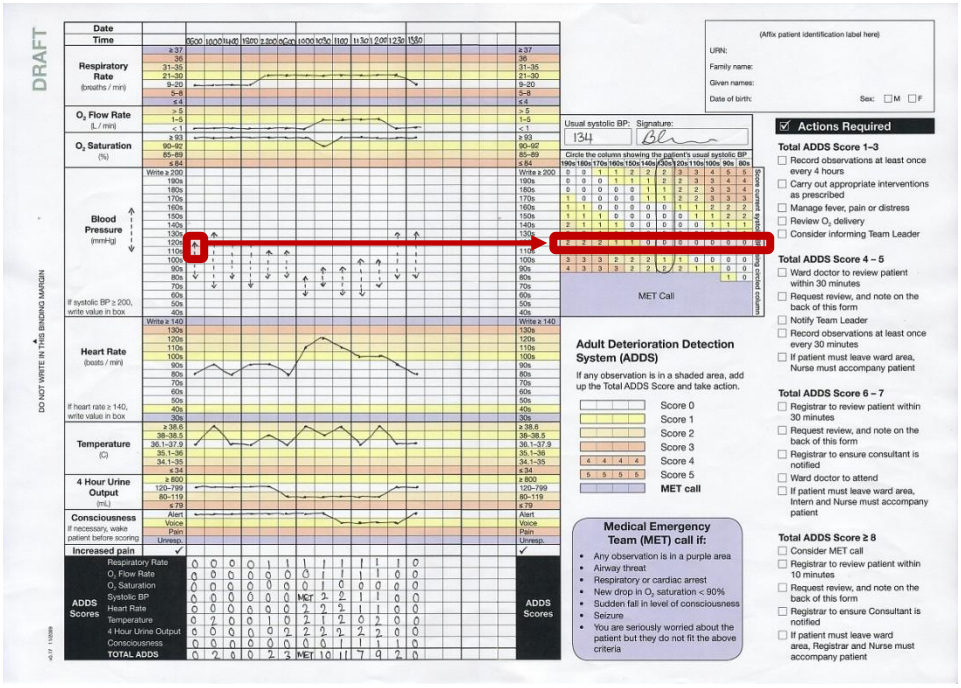
For example, let's say your patient's usual systolic blood pressure is 134 and their current systolic blood pressure is in the 120s.

3.



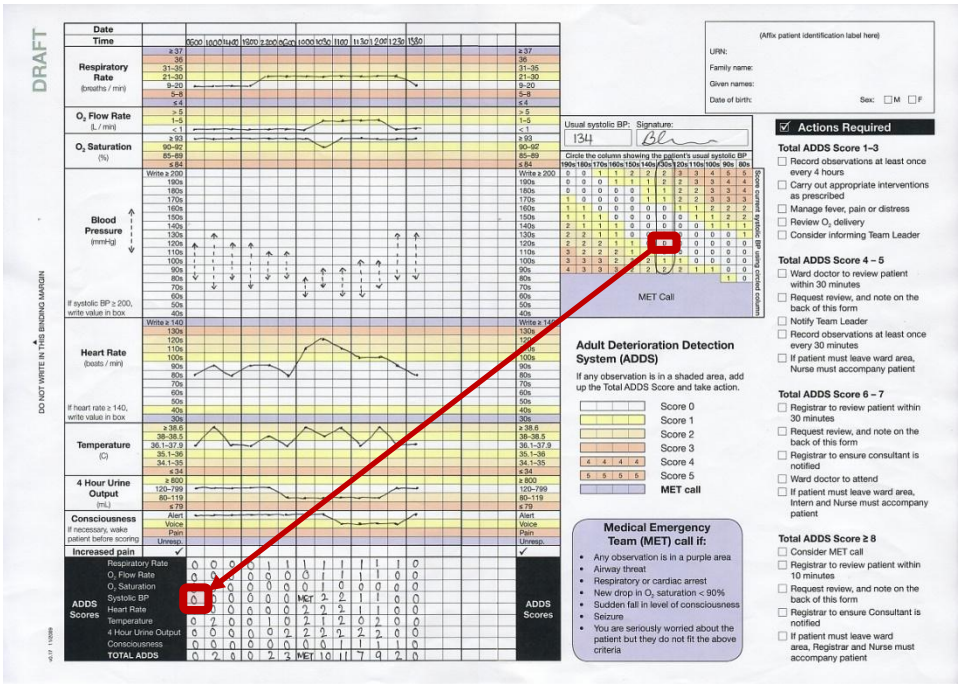
You would begin by checking that the column showing the patient's usual systolic blood pressure is circled correctly on the scoring table on the right-hand-side of the page.

4.



Each time that you need to score blood pressure, you use the patient's current systolic blood pressure and move your finger across the row until you reach the circled column. The cell where the row and column intersect contains the correct ADDS score. In this example, the score in the correct cell is zero…

5.



… so you would write zero in the row for blood pressure scores, indicating that the observation was normal.