Honesty Equality Accountability Respect Teamwork

Putting **patients** at the **HEART** of everything we do

NHS
London North West Healthcare
NHS Trust

NG SIG Update

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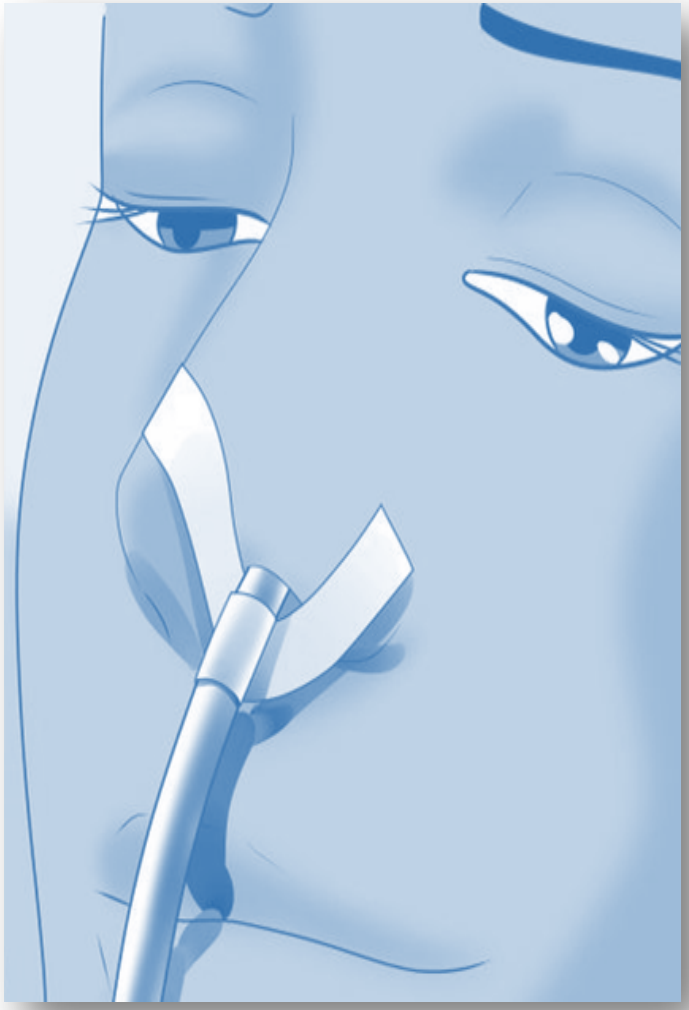
BAPEN

St MARK'S HOSPITAL

Introduction



- Present results of NG practice survey
  - Never events
  - Indicators used
  - Cut off values
  - Single vs double checking
- Analysis of currently available 0.5 increment CE marked indicators
  - Inter rater reliability
  - The impact of time on result
  - Ease of matching colours
- Initial evaluation of photometer

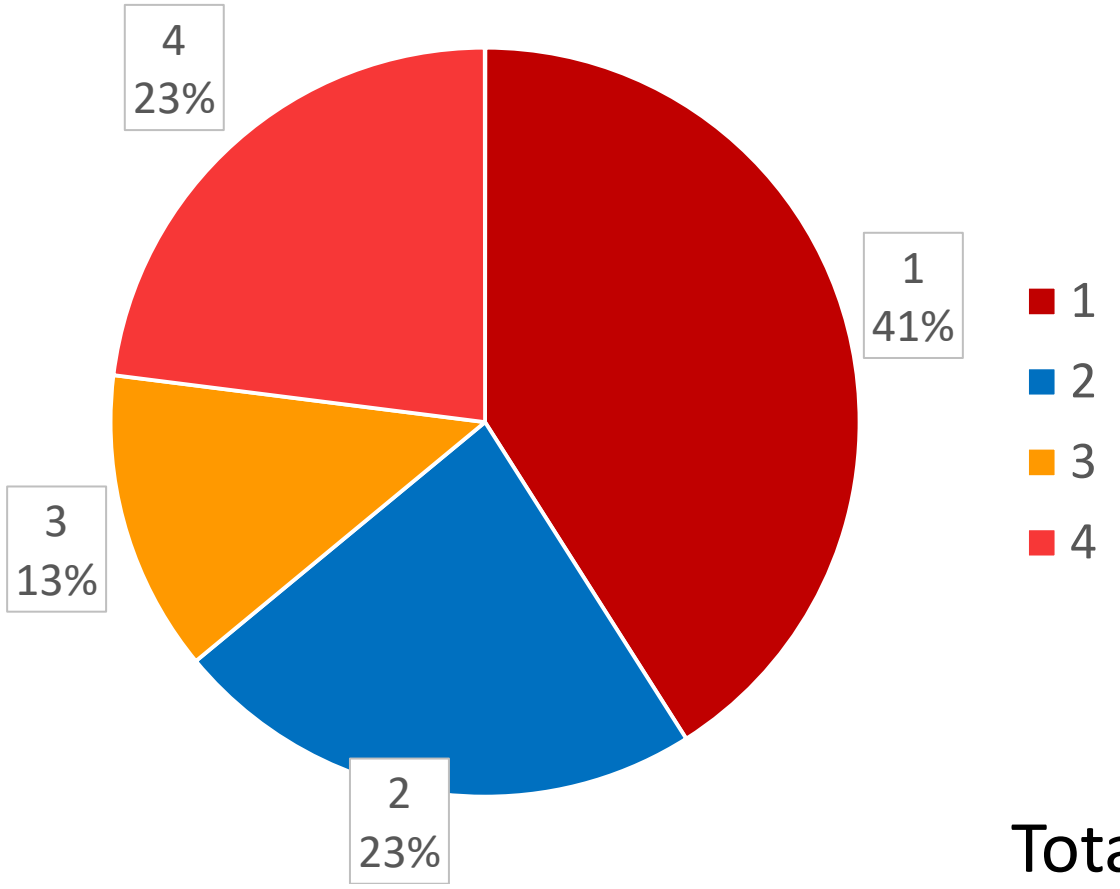
Survey of NG Practice

NG Practice Survey

- Electronic survey sent out via NNNG
  - Never Events
  - Cut off values
  - pH indicators used
  - Single or double checking
- 33 responses to date

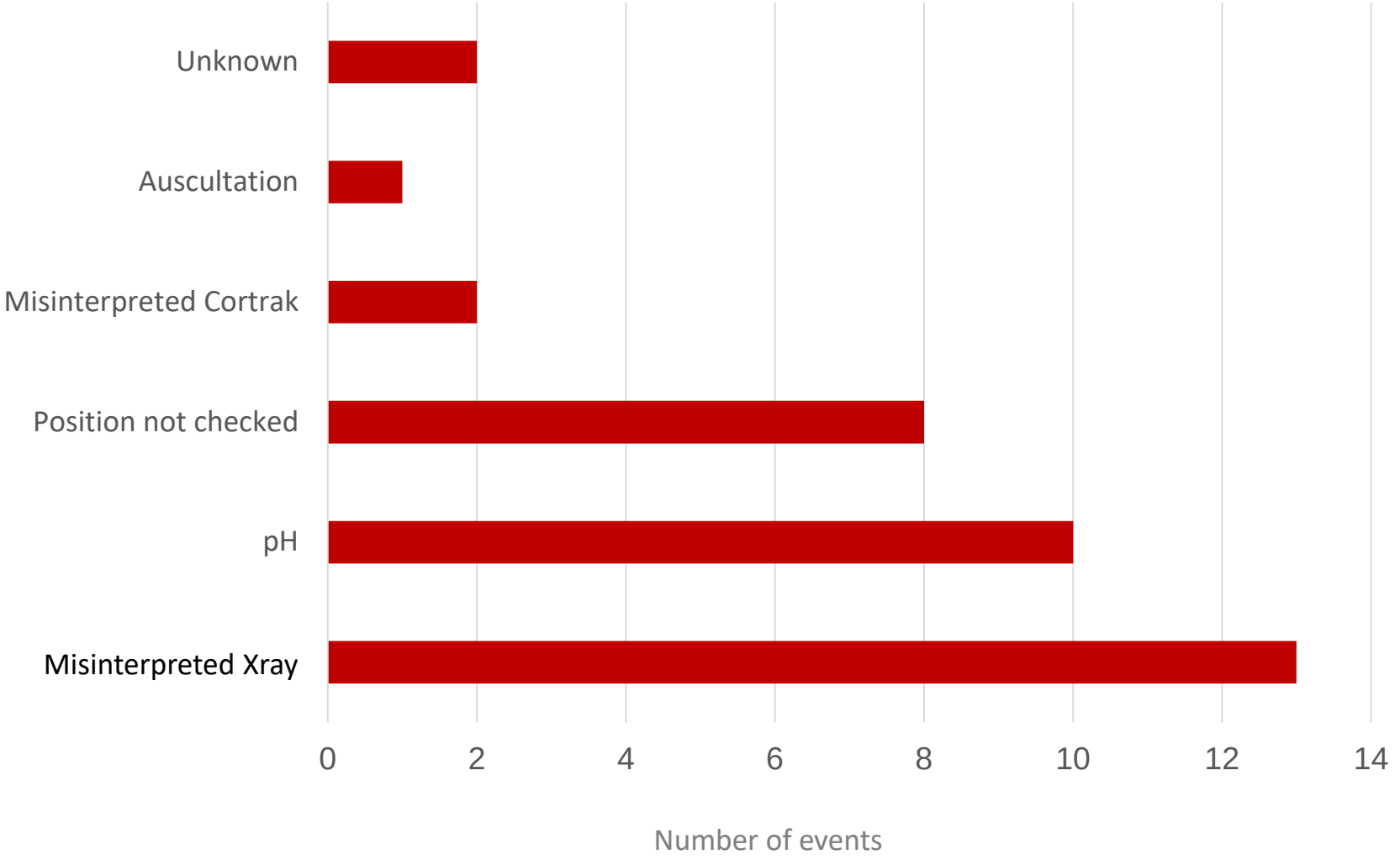
Never Events

22(64%) responders had had a Never Event in their Trust since 2009

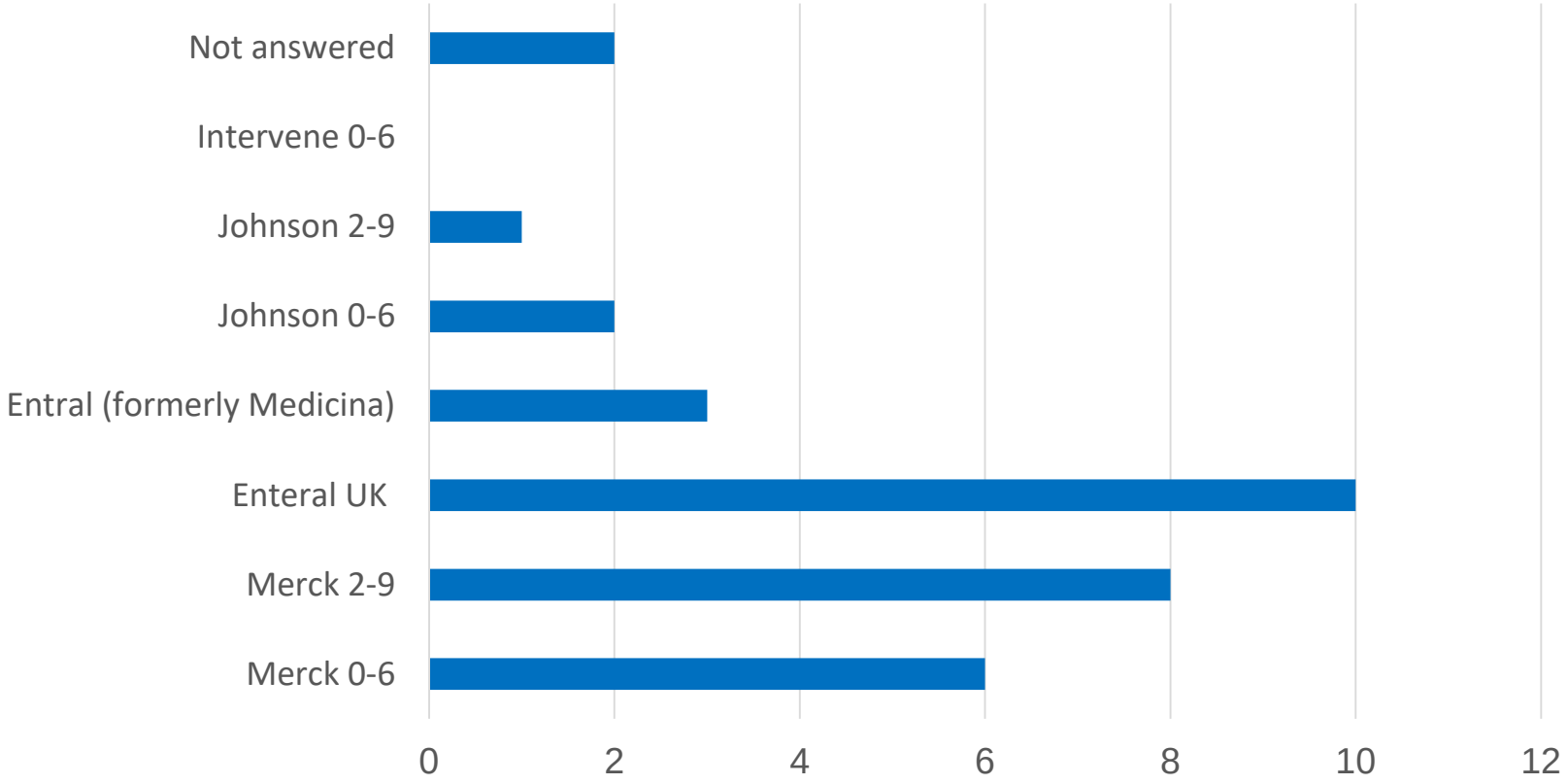


Total 34

Cause of Never Event

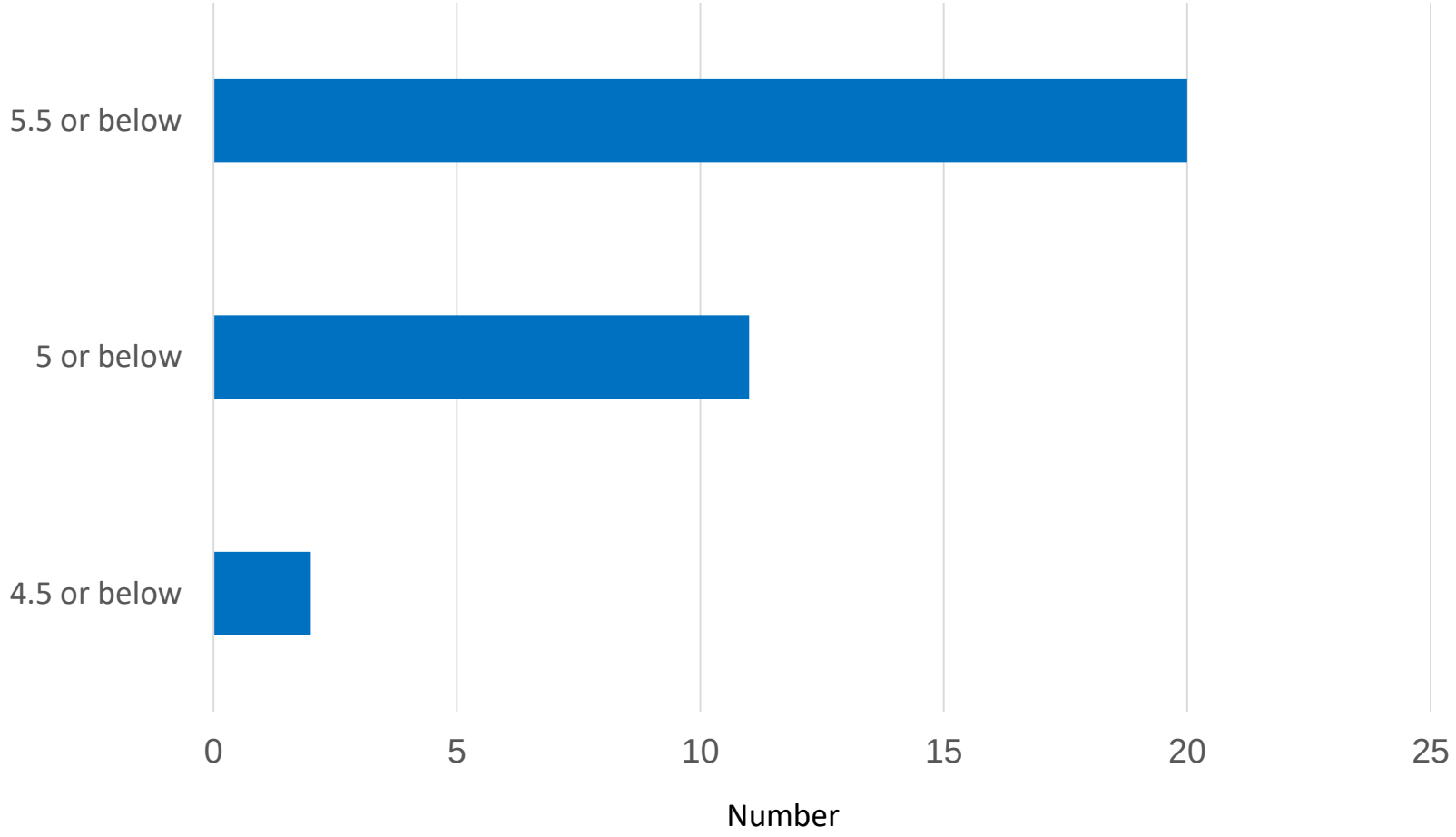


pH Indicator Used



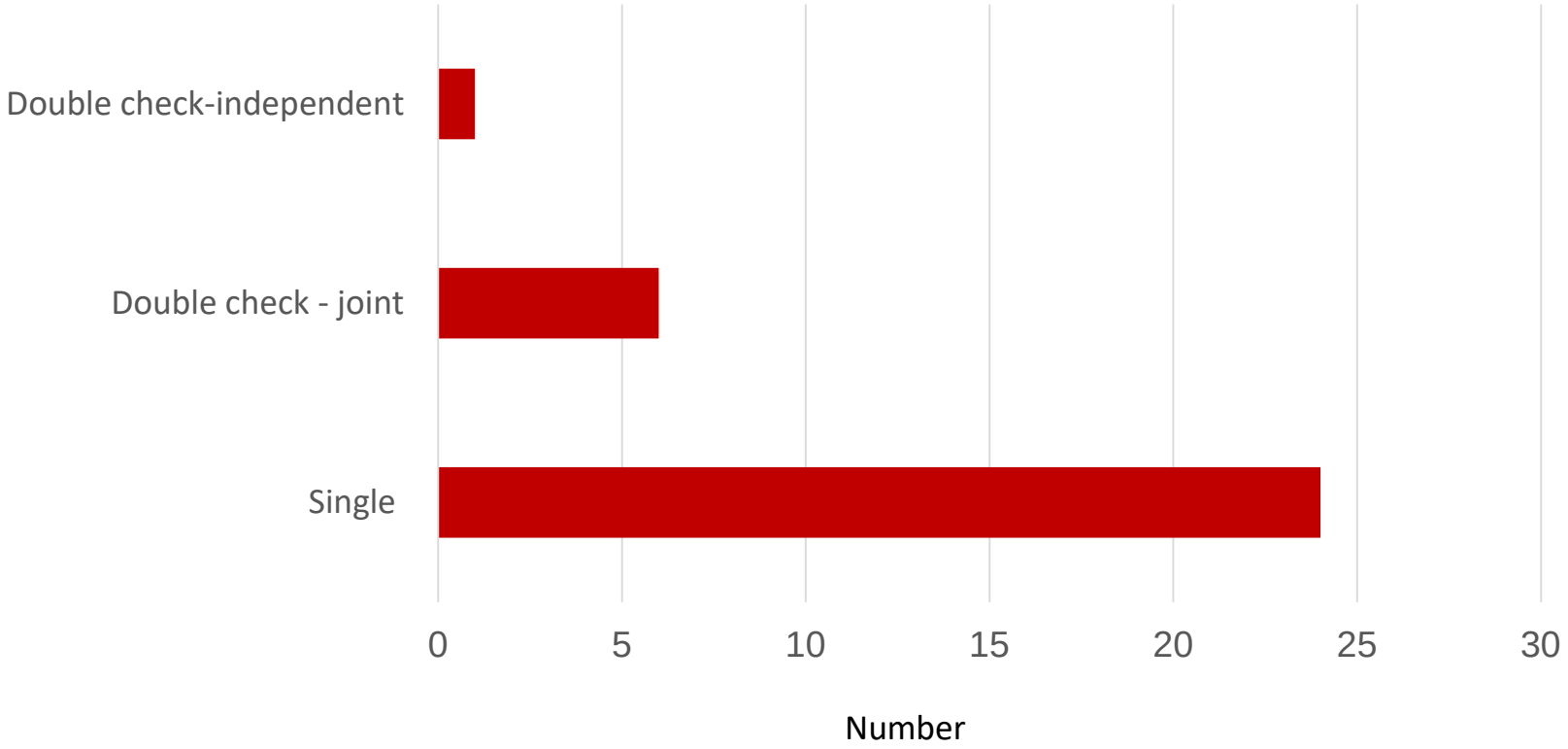
71% responders had been involved in the decision

Cut off value

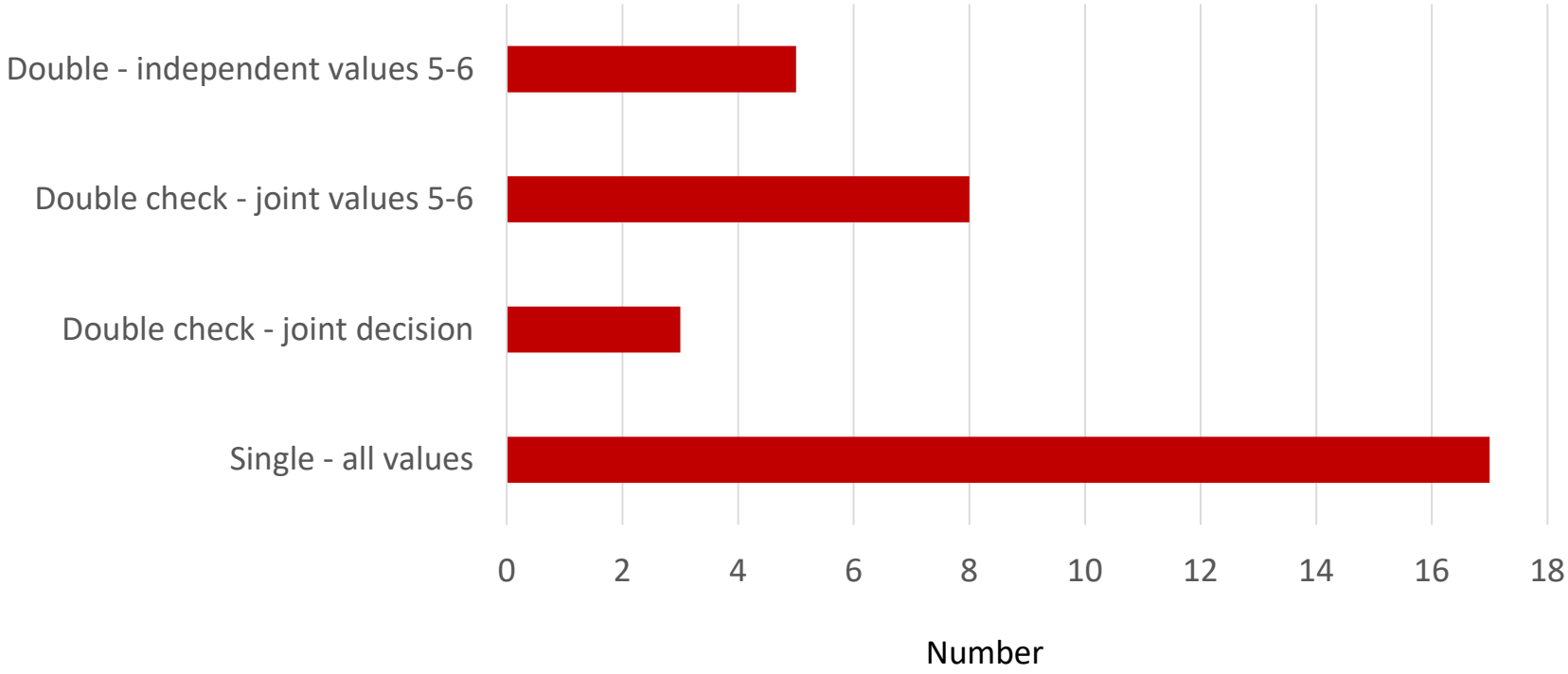


Same values for subsequent checking

Number of checkers – initial placement

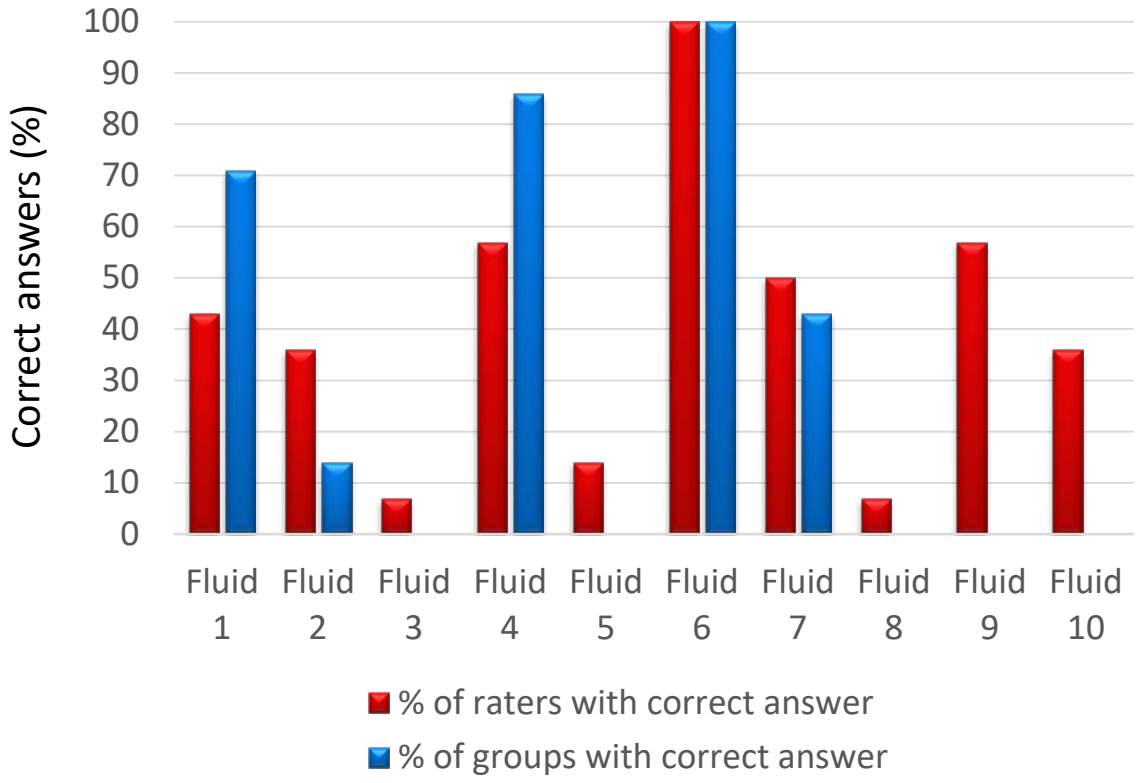


Number of checkers – subsequent checks



Single vs double checking

pH of 10 clear fluids assessed by 14 raters, once on their own, once with a “buddy” compared against value from a pH meter



Single raters
mean 41 ± 28.2 (7-100)% correct answers

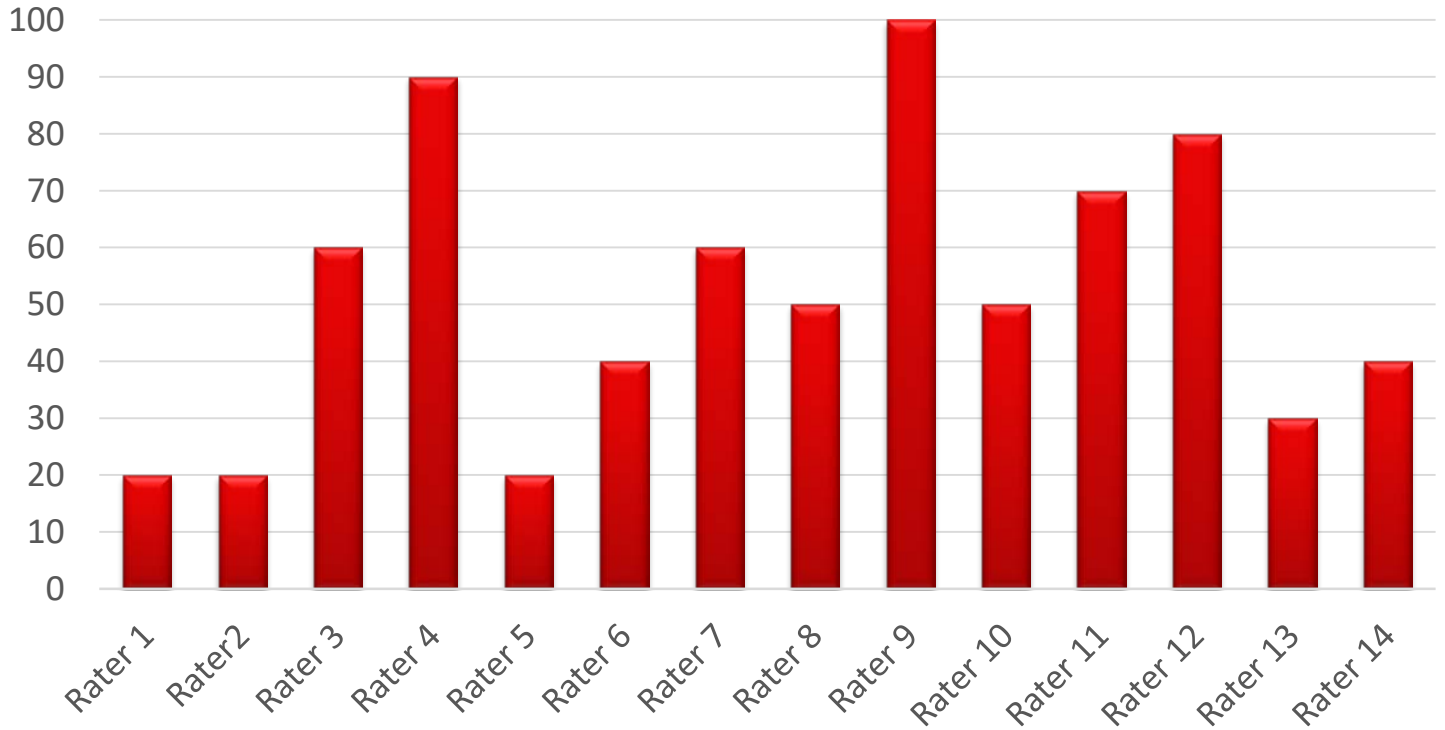
Group raters
mean 31 ± 40.3 (0-100)% correct answers

Only one sample correctly identified by all raters & groups, pH 3

More correct answers when raters made decision on their own, vs with a buddy, but difference not statistically significant p=0.09

Measurements in agreement

Measurements in agreement (%) between single test and that with a buddy



mean 54 ± 26
(20-100)%

Only 1 rater had the same measurements when reading alone vs with a buddy

Analysis of currently available 0.5 increment CE marked indicators

Background

- The discontinuation of 2 commonly used CE marked indicators will result in many Trusts needing to select an alternative product
- This in-vitro study aimed to evaluate the available CE marked 0.5 unit pH indicators
  - Inter rater reliability
  - The impact of time on the result
  - Ease of matching colours

Method

- pH of 30 non buffered fluids was assessed by 4 raters using 4 CE marked 0.5 unit increment indicators
  - 1 rater undertook the assessment on 2 separate occasions (test-retest)
- Measurements were taken at 3 time intervals
  - 15 seconds
  - 30 seconds
  - 60 seconds
- The results were validated against the pH obtained by a calibrated pH meter

Indicator details

Indicator 1	pH 2-9 3 colour pads, plastic strip titrated to pH 7
Indicator 2	pH 0-6 3 colour pads, plastic strip titrated to pH 7
Indicator 3	pH 2-9 3 colour pads, plastic strip titrated to pH 7
Indicator 4	pH 0-6 3 colour pads, plastic strip titrated to pH 6

Indicator 2 & 4 use the same pH indicators but the pH of the plastic strip they are bonded to is different

Results

- There was good correlation between the values from the 4 indicators compared with the values from the pH meter
  - These differences were not statistically significant
- Only 8 (2%) occasions where the same pH value obtained from all 4 indicators
  - Analysis of Variance between the 4 indicators was significant, $F=7.6$, $p<0.001$
- Differences would have resulted in the incorrect clinical decision being made 107-178 (30-49%) occasions

Inter rater reliability

- Analysis of variance between the 4 raters for all measurements by all indicators was significant , F=4.8, p=0.002
- However, not for each individual indicator

	Indicator 1				Indicator 2				Indicator 3				Indicator 4			
	Rater 1	Rater 2	Rater 3	Rater 4	Rater 1	Rater 2	Rater 3	Rater 4	Rater 1	Rater 2	Rater 3	Rater 4	Rater 1	Rater 2	Rater 3	Rater 4
mean	5.7	5.8	5.7	5.9	5	5.4	5.1	5.3	5.1	5.3	4.9	5.3	5.5	5.5	5.3	5.5
SD	1.6	1.6	1.5	1.6	0.9	1.0	0.9	0.9	1.1	1.0	1.1	1.1	0.9	0.9	0.9	0.9
Min	3	3	3	3	3	3.5	3.5	3	3	3.5	3	3	3	3.5	3.5	4
Max	7.5	8	7.5	8	6*	6*	6*	6*	6.5	6.5	6.5	7	6*	6*	6*	6*
ANOVA	F=0.5, p=0.7				F=4.7, p=0.003				F=2.9, p=0.03				F=1.3, p=0.3			

Test-retest

	Indicator 1	Indicator 2	Indicator 3	Indicator 4	All
Test-retest	t=0.4, p=0.6	t=0.7, p=0.5	t=0.9, p=0.3	t=1.5, p=0.1	t=0.3 p=0.6
Matched answers n(%)	61 (68%)	37 (41%)	40 (44%)	46 (51%)	184 (51%)
Unmatched answers which would have resulted in a different clinical decision					
pH 5 cut off	13 (14%)	12 (13%)	22 (24%)	19 (21%)	66 (18%)
pH 5.5 cut off	3 (3%)	23 (26%)	27 (30%)	23 (26%)	76 (21%)

Indicator 2 vs Indicator 4

- Statistically significant difference between values from the 2 indicators
  - T=3.9, p=<0.001
- Only 155 (43%) matched answers
- Unmatched answers would have resulted in a different clinical decision
- pH 5 cut off
  - 66 (18%) occasions
- pH 5.5 cut off
  - 106 (29%) occasions

The effect of time on result

	Number of fluids with different result obtained at different time intervals			
Rater	Indicator 1	Indicator 2	Indicator 3	Indicator 4
1	20 (67%)	20 (67%)	20(67%)	15 (50%)
2	17 (57%)	8 (27%)	22 (73%)	11(37%)
3	14 (47%)	14 (47%)	15(50%)	20 (67%)
4	7 (23%)	14 (47%)	14 (47%)	21 (70%)
Total	58 (48%)	56 (47%)	71 (59%)	67 (56%)

Occasions where difference in result affected clinical decision

	pH 5				pH 5.5			
Rater	pH Indicator				pH Indicator			
	1	2	3	4	1	2	3	4
1	10 (33%)	5 (17%)	8 (27%)	0	0	12 (40%)	15 (50%)	12 (40%)
2	6 (20%)	0	6 (20%)	1 (3%)	3 (10%)	4 (13%)	13 (43%)	10 (33%)
3	2 (7%)	4 (13%)	6 (20%)	6 (20%)	3 (10%)	3 (10%)	7 (23%)	12 (40%)
4	7 (23%)	9 (30%)	6 (20%)	9 (30%)	5 (17%)	2 (7%)	2 (7%)	7 (23%)
Total	25 (21%)	18 (15%)	26 (22%)	16 (13%)	11 (9%)	21 (18%)	37 (31%)	41 (34%)

Ease of matching colours

Pantone® ColourPlus matching system

Pantone® Capsure™ digital colour matching device

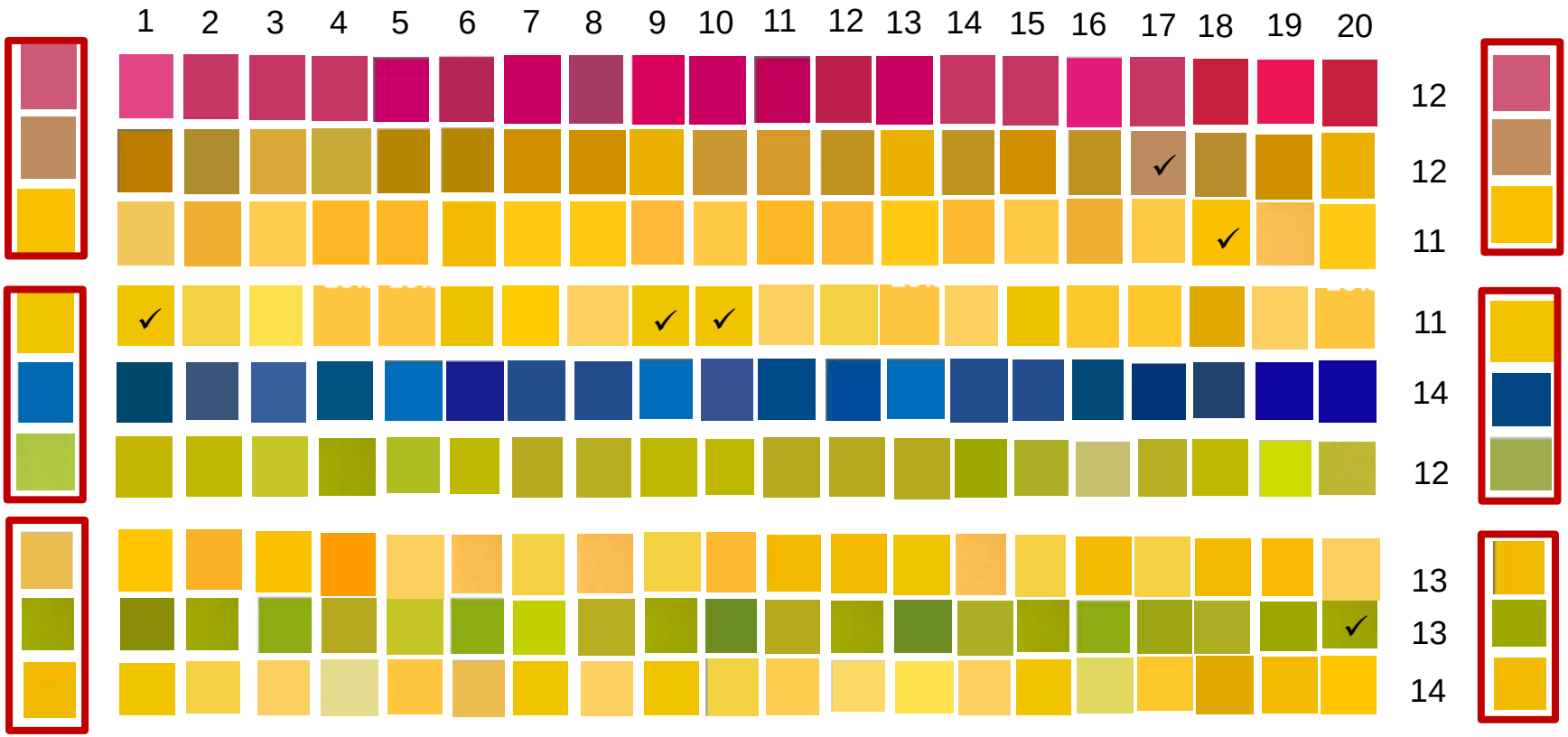
- 20 raters (10 female:10 male) identified the colours in 3 CE marked pH indicators between pH 4-6 using a validated colour matching system (Pantone® ColourPlus)
  - Assigns a numerical value to each colour
- This was compared to the actual value determined by a digital calibrated colour matching device (Pantone® Capsure™)

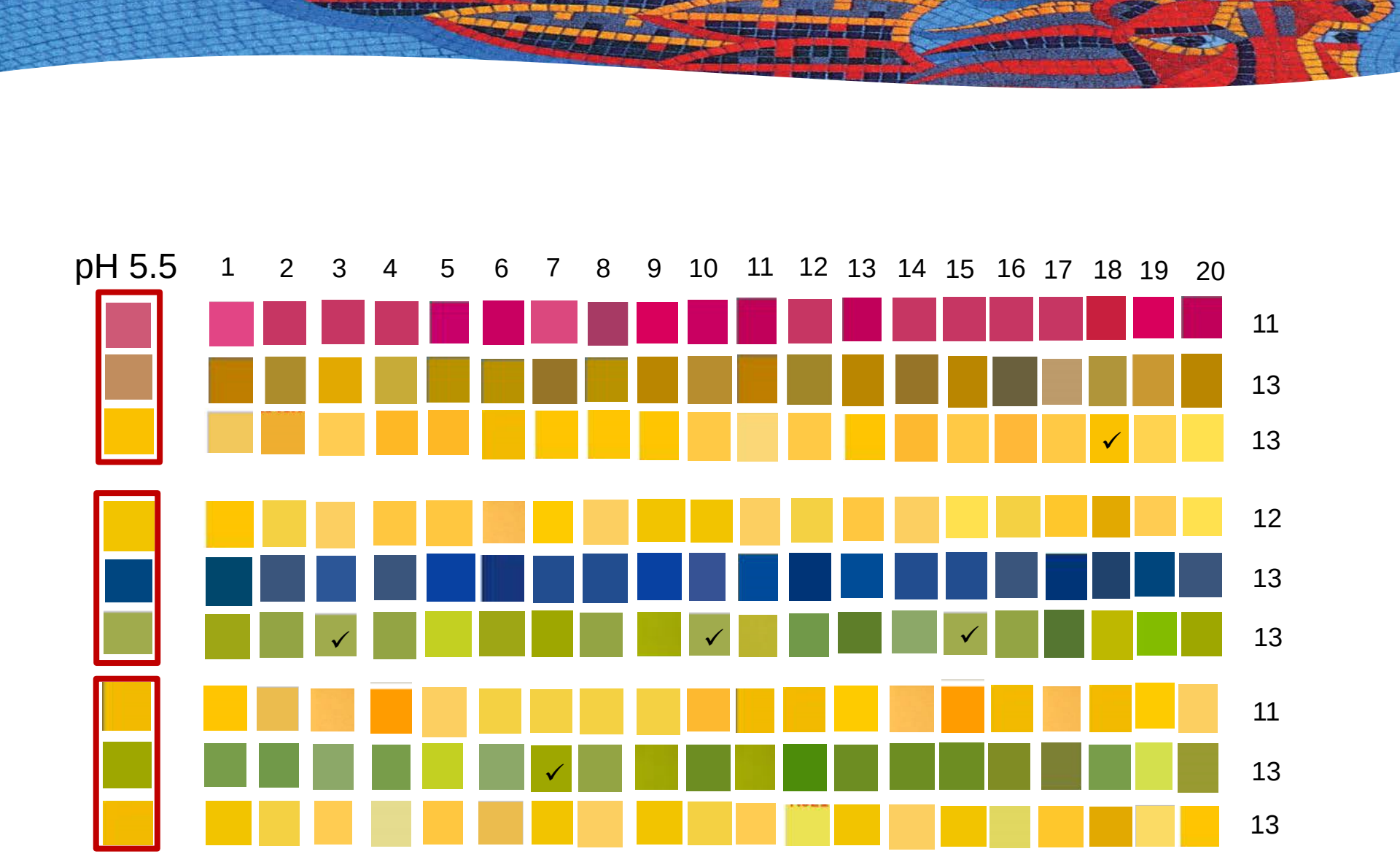
Results

	pH Value					
Indicator	Colour row	pH 4	pH 4.5	pH 5	pH 5.5	pH 6
1	1	10	11	12	11	8
	2	12	16	12	13	16
	3	12	12	11	13	11
2 & 4	1	13	12	11	12	13
	2	13	11	14	13	13
	3	14	11	12	13	11
3	1	12	13	13	11	13
	2	11	11	13	13	14
	3	14	14	14	13	12
Mean ± SD		12.3 ± 1.3	12.3 ± 1.7	12.4 ± 1.1	12.4 ± 0.9	12.3 ± 2.2
Min		10	11	11	11	8
Max		14	16	14	13	18

pH 5

pH 5.5




pH 5.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
11
13
13
12
13
13
11
13
13

Initial evaluation of photometer

Evaluation of photometer to asses pH

- Photometery assesses pH by measuring the amount of light absorbed thereby determining the colour
- Point of care testing
- Removes subjectivity from the assessment of pH value
- Has the benefit of a permanent record of the measurement
- Initial evaluation of product measuring the pH values of 30 non buffered fluids & comparison against the values obtained from a calibrated pH meter

Results

- Good correlation with results obtained from the photometer vs the pH meter
  - No statistical difference
  - Correlation, r=0.98
- Photometer only reads in 0.5 increments so could not be perfectly correlated
- Only 1 value where the photometer result differed from the pH meter result
  - Difference would not have affected the clinical decision

Summary & recommendations

- Despite national guidance variation in NG practice exists
- Evaluation of the CE 0.5 unit pH indicators revealed differences in their performance
- The time taken to read the result can impact on the clinical decision
- The accuracy of the indicators is affected by which cut off value is used
- There was significant inter rater variation supporting the need for a less subjective method of assessment