DRAFT PROJECT REPORT

EFFECTS ON PRACTICE OF SIMULATION TRAINING

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SUMMARY

Immediate effect of training day on confidence

In cardiovascular, respiratory, infectious and gastrointestinal topics, when comparing the prior confidence levels of trainees who had already had experience of an emergency used for the simulation session, with the overall outcomes of the day, the study shows that the training day had some effect on improving the overall confidence of participants in dealing with the focal emergencies.

Trainees with prior experience of genitourinary emergencies were less confident than they were for respiratory, gastrointestinal and cardiovascular topics. More than half were not very confident. After training, a picture emerged of trainees who were still largely not very confident. This is an important finding, reflected also in the findings in relation to neurological emergencies, since specifically genitourinary or neurological topics were not addressed in the training day. We can conclude that the effects of that training tend to be case specific rather than generalisable – which would be commensurate with our knowledge of assessment and clinical problem solving.

The training day increases confidence in those emergencies that were the subject of scenarios.
The increase in confidence is case specific such that confidence does not improve in emergencies not presented in scenarios during that training day.

In terms of tasks previously experienced, those reported by more than half the participants, were individual [hand washing, cannula insertion etc]. Fewer than half reported tasks associated with team working [allocating tasks to team members, for example]. For all specific tasks except two [hand washing and wearing gloves] confidence overall increased as a result of the training day. In the two tasks where this was not the case, the data suggest that there was perhaps some overconfidence prior to the course.

Participants in general do not report prior experience of team working.

Confidence in all specific tasks, except the most common ones of hand washing and wearing gloves, increased as a result of the course. For these common tasks, it seems that participants were originally very confident and that the course may well have made them reflect further on their actual behaviour in these areas.

In relation to the immediate effects of the training day on specific clinical and process/professional tasks:

- Where there was a decrease in confidence [in glove wearing and hand washing], the pre-training scores had been nearing the maximum and the decrease was minimal, suggesting no real change.
- The greatest increase [of 18%] was observed in the areas that had the lowest pre-training score [Taking a lead role in a cardiorespiratory arrest or trauma].
- Four of the 5 areas showing greatest increase were in areas of general professional skill [taking a lead role, maintaining an overview, verbalising a diagnosis]
- In 10 of the 15 areas, the standards deviation decreased after training implying a movement towards similar standards of achievement across the groups.
- The minimal observed change in the key skills of calling for help [0%] and declaring an emergency [2%] must be interpreted in the light of the relatively high pre-training scores. The post-training average score for calling for help was nearly at the maximum [3.57].

Overall, the figures suggest that trainees entered the course with relatively high confidence in most task areas and that the training demonstrated immediate added value in both lower and higher scoring areas in both professional and clinical domains.

Overall, the trained group feel more generally confident than the control group [mean score of 2.73 vs. 2.38]. However, the cohort actually felt more confident than the control group in only 2 out of the 8 types of emergency experienced.

In relation to the effect of the training day on trainees' likelihood of calling for help in named emergency circumstances:

- Trainees already were already likely to call for help in the cases of cardiac and respiratory arrest, and blue and breathless patient, so here little change could be expected as a result of the training day.
- All observed changes were small, none exceeding 8%
- Pre-training trainees were more likely to call for help in every circumstance than not to call for help.

In these areas, therefore, the training day was likely to have a reinforcing effect rather than one which actually seemed likely to change behaviour.

Performance and confident after 4 months

In all but two tasks [calling for help and maintaining on overview], the control group after 4 months feel more confident than the cohort group. The reason for this is not clear – it might be that training has enabled the junior doctor to appreciate dangers that are otherwise not seen or to compare themselves with a standard of practice that the control group do not have. In this study, we do not know the extent to which confidence correlates with performance.

After 4 months, the cohort group are marginally more likely to call for help in six the 11 emergencies listed although standards deviations are relatively large in these cases. There is general positive willingness in both groups to call for help in the cases of cardiac or respiratory arrest.

Added educational value

To test whether the simulation training had any effect on the training benefit that trainees accrued from subsequent experience, we measured the changes in self-reported performance over the 4 months after the baseline measures. The following tables show that:

- The cohort improved, overall, at a greater rate than the controls in their confidence in handling emergencies.
- The cohort improved, in general, at a greater rate in performing tasks than did the control group.
- Overall, neither group became more willing to call for help – the observations suggest that they actually became less willing to do so 4 months after the baseline measures. This might be because of increasing felt competence. We do not know whether their decreased willingness is appropriate or not.
- There are no systematic changes in the groups' reasons for calling for help or not between the baseline study and 4 months later although the possible reasons for not calling help became less potent for the control group over that period.
- The control group changed more in relation to knowing the importance of the team having started from similar levels of awareness. This was particularly so in relation to the importance of porters.

Conclusions

This extensive study has found no systematic differences between the cohort and control groups 4 months after the baseline measurements except in the case of recognising the importance of other members of the

team [with the exception of porters]. We can only hypothesise reasons for this observation:

- We might not have identified the other areas in which differences can be observed
- The controls had undertaken more tasks and experienced more emergencies than the cohort and the results might indicate that learning in a concentrated simulation was equivalent to learning from more tasks in practice.
- The differences in valuing the team might be due to lack of direct experience of these team members in the controls and deliberate focus on them in the cohort's simulation training.

In relation to the speed of improvement of the cohort and the control groups during the 4 months under report, the cohort's greater relative improvement in handling emergencies and in performing tasks might be indicative of a factor worthy of further research – although the current size of observed difference is unlikely to be statistically significant.

Given the equivocal findings of this study, and of previous studies, and the continuing development of and enthusiasm for high fidelity simulation training – which does have an obvious face validity – we must conclude that further work is required to identify and measure the specific benefits of this training approach. It seems that the research methods used to date have not been adequate to this task and a new approach is required that asks different questions rather than trying to measure attributable changes in behaviour which is notoriously difficult in any educational environment.

PART ONE:

BACKGROUND AND METHODOLOGY

1 INTRODUCTION

All Foundation year 1 trainees in the London Deanery have the opportunity to undergo a 10day training session in a high-fidelity simulation environment which offers five scenarios with feedback: intestinal obstruction, SIRS post laparotomy; GI bleed, asthma; MI and VF arrest.

Although the training differs slightly between the 3 centres involved, there are, in general, intended shared outcomes in terms of drills and skills, non-technical skills, attitudes and behaviour, confidence building, roles and responsibilities, potential impact of the individual on the situation and some knowledge elements. Generic outcomes might be described as:

- Use of a structured approach
- Instituting appropriate monitoring
- Reviewing available information
- Taking a patient history
- Conducting a patient examination
- Formulating a working diagnosis
- Requesting appropriate investigations
- Prescribing medications accurately and safely
- Instigating immediate management
- Demonstrating effective team working and communication
- Calling for help as appropriate
- Giving an accurate handover report
- Formulating a management plan
- Managing emergency situations effectively
- Reassessing and evaluating the effectiveness of treatment
- Promoting infection control
- Promoting patient safety
- Using recognised protocols and guidelines where appropriate.

2 BACKGROUND

Simulation training is a widely used approach to concentrated learning. There is a sizeable literature relevant to a number of specialties and situations. Although we do not intend to review that literature, a brief overview might be helpful.

A discussion of the literature published on the topic of simulation in both undergraduate and postgraduate teaching must begin with the areas on which it has an impact. These are widespread and include clinical skills, risk management, lifelong learning, education, training, continuing personal and professional development, staying and stay management, continuous quality improvement and the management of poor performance[i].

There are several reasons for its increased appearance in both undergraduate and postgraduate teaching. The first, and main, recognised advantage of clinical simulation over traditional methods is that it presents a 'safe' environment[i]. Learners are encouraged, for example, to understand the common mistakes in clinical procedures[ii]. This unique approach to making errors is a central characteristic of simulation based medical education[iii] (SMBE). This is stressed in nearly all papers published.

Kneebone (2003)[6] provides a summary:

> 'Scenario-based training provides a powerful learning experience, allowing participants to build their technical expertise and apply it within a holistic clinical context without the risk of causing harm.'

Human patient simulator technology has evolved rapidly over the past two decades, now providing numerous clinical features which can provide a realistic setting in which learning takes precedence over patient care. Medical students can acquire basic skills while more advanced students can refine and rehearse their knowledge[iv].

Secondly, as Bligh (2003)[i] points out,

> 'Medical simulation offers tremendous opportunities for the advancement of our understanding of learning because it is consistent with very different ways of conceptualising learning.'

These learning theories can be summarised as:

- Behaviourist learning theories
    - The learner repeats the practice until it becomes natural and widely applicable
    - Simulation is relevant because the theories are not concerned with how the learner make sense of the stimuli and responses that they receive and make
- Constructivist approach
    - The learner is encouraged to reveal their thinking

    - The simulator can respond to this so that the learner sees the outcomes immediately
- Activity theory
    - Understanding and skills learned in simulations can be extended to real life situations
    - Learning can be focused using simulator, whereas it may become muddled when the learner also must consider the patient's needs for diagnosis and treatment

Thus simulations can also be used as an effective research tool.

Thirdly, technological advances have seen the development of a variety of simulators. Many resources are available[v], including:

- Models, manikins and clinical equipment
- High fidelity simulation
- Information and communication technology (ICT)
- Audio-visual facilities

However, '*those who have the skills and resources to develop simulators are not necessarily driven by the same agendas as those who use them to facilitate learning*[vi]' (Kneebone, 2003) and there may be a tendency to let this field become dominated by technology, while losing sight of the original aim – patient care. The '*challenges lie in the development of improved methods of assessment in order to evaluate the contribution that simulators make to training'* and how they improve the quality of care.

Authors frequently point out that it is important to remember that simulation facilities cannot replace clinical experience. Although students feel that their competency increases following simulation training[vii], we are encouraged to be aware that manikin confidence does not equate with clinical competence[viii]. Simulations can operate in isolation from their clinical context, ignoring the needs of individuals within a real health care environment. Simulation, it is concluded, must be used alongside clinical practice and linked closely with it[ix].

The advent of increased use of simulation is also because of the '*recent reforms in undergraduate and postgraduate education, combined with political and societal pressures, promoting a safety-conscious culture*[x].' As demonstrated, simulation provides a means of risk-free learning in complex, critical or rare situations.

Much of the literature is concerned with integrating simulation into the curriculum[viii]. Studies have shown that integrated models are feasible and reflective practice may assist with the successful transfer of these

skills to other procedures. The value of the simulation is mostly evaluated by interview[vii].

Tensions often arise between the design and evaluation of simulations. A lack of high quality of data is compounded by the difficulties of conducting longitudinal studies in such a fast moving field[vi].

Simulations are used in assessment – and results show that more highly trained practitioners score more highly in simulated situations. The conclusion is that the simulations accurately reflect clinical situations[iv]. The challenges lie in the development of improved methods of assessment in order to evaluate the contribution that simulators make to training and ultimately to the quality of patient care[xi]. A combination of instruments must be used, including – unobtrusive – observations in real practice[xii]. The technical challenges of developing assessments in simulated environments cam be addressed in the same way as in any other assessment situation. So, for example, the technical characteristics of a global rating scale in a simulated environment, have been examined[xiii].

People who act as simulated patients (adopting a set of symptoms, history etc) for the purposes of assessment often experience negative effects. These, such as pain after several examinations, are considered to be inherent. Simulated patients, however, do not respond well to being asked to perform a role too far removed from or too close to their own situation. Some guidelines have been drawn up to reduce these adverse effects[xiv]:

- Limit performance
- Short breaks scheduled
- Standby simulated patients in case patients require a rest
- Encouraged to turn down roles they are uncomfortable with
- Change or adjust patients roles after 4 years

In conclusion, at the present time the quantity and quality of research in the area of simulation for medical education is limited. There are few studies evaluating the benefits to patient care, most concentrate on the risk-free, safe learning environment provided by simulation. Integration into the curriculum seems feasible, but it must be alongside, not instead of, real patient interaction.

Given this, the evaluation of the London Deanery initiative became an important project to undertake.

3 AIMS OF THE STUDY

The aims of the study were to:

- Determine the immediate effects of the taining day on the confidence and achievements of trainees
- Determine the confidence and achievements of these trainees in real-life emergency situations
- Compare the trained cohort with an untrained cohort at similar stages

Decide whether simulation training has an effect on practice in real situation.

4 METHODOLOGY

4.1 Cohort

Data collection began in October 2006 for London Deanery FY1 trainees attending a simulation training day at one of the three participating centres (Chelsea & Westminster, St Bartholomew's and The London, St George's). Prior to the start of the project, it was anticipated that there would be approximately 840 trainees in the cohort.

Two survey instruments were designed and developed comprising:

- A **pre-training questionnaire** to be completed at the start of the day, prior to the simulation training taking place. This instrument collected information on demographics, previous simulation training and experience of emergency situations.
- A **post-training questionnaire** to be completed at the end of the simulation training day. This instrument collected data on the trainees' views on how confident they felt they would be dealing with emergency situations in the future.

Trainees were also asked to provide contact details, including a current email address, in order to receive the follow-up questionnaire.

Trainees were only recruited to the study when full consent was given. Each trainee received an information sheet explaining the purpose of the project and their involvement. Trainees were asked to sign and return a consent form.

Completed questionnaires were collected in person by a member of the OUCEM team. Each member of the OUCEM team attended and observed

at least one training day to improve the team's understanding of the simulation training and the scenarios involved.

Trainees from 15 training sessions (≈150)[1] were excluded from the data collection process as the simulation training sessions were held during September and early October when the data collection instruments were being finalised following consultation with the Deanery and the simulation centres.

Therefore, a total of 64 training sessions distributed over the 3 participating centres were held between October 2006 and March 2007. A potential cohort of approximately 640 trainees was available for inclusion in the study.

At the beginning of December 2006, the data collection process changed. Due to the time constraints faced by the simulation centres during the course of the training day, it was agreed that the centres would collect the names and email addresses of doctors participating in the training day, and return the information to OUCEM. A third questionnaire was designed to collect information from the trainees contacted via email. Essentially this instrument combined information from the original **pre** and **post training** questionnaires. OUCEM received information from 26 of the simulation training days. Questionnaires were then sent to the doctors via email.

21 training sessions took place where OUCEM did not receive any trainee data.

A total of 11 reminders were sent out during this period to encourage questionnaire return.

4.2 Control Group

A parallel instrument was designed and developed to collect parallel data from a control group. The control group would comprise trainees from other deaneries who did not experience simulation training in acute clinical care and crisis management. This questionnaire collected information on demographic data, previous simulation training experience and experience of emergency situations.

Two deaneries agreed to be involved in the project, Eastern and Wessex.

Control group trainees also received an information sheet and were recruited to the study when consent was given.

[1] This is calculated on the basis that there are 10 trainees in each of the training sessions.

4.3 Real Incident questionnaire.

A further instrument was designed and sent to all cohort and control group trainees who had consented to be involved in the study, regardless of whether or not they had completed and returned the initial questionnaire(s).

This instrument collected information on trainees' experience of any of the scenarios used in the simulation training day in real life.

Initially, this questionnaire was planned to be sent every four months from the date of the training day, or recruitment to the study, but given the low response rate it was decided that the questionnaire would be sent once and concentration placed on increasing the response rate.

4.4 Response rates

For the cohort, a total of 322 trainees consented to take part in the project. This is 50% of the total number of trainees potentially available for inclusion in the study. For the control group, 70 trainees consented to take part.

Pre and post training questionnaires were received for 164 of the cohort trainees, 51% of consenting trainees (n=322) or 26% of all potential trainees (n=640).

It is also interesting to note that of the 164 completed questionnaires from the cohort, 147 were collected at the training sessions and only 17 via email.

69 questionnaires were received from the control group.

The **Real Incident** questionnaire was sent to all consenting trainees in both the cohort and control group (n=392). 78 completed questionnaires were returned from the cohort and 34 from the control group (RR 24% and 49% respectively).

Table 1. Number of completed questionnaires.

Group	Pre and post training questionnaire	Real Incident questionnaire	*Total*
Cohort (London)	**164**	**78**	**242**
Completed at Centre	*147*	*N/A*	*147*
Collected by email	*17*	*78*	*95*
Control (Eastern/Wessex)	**69**	**34**	**103**
Total	**233**	**112**	**345**

A total of 17 follow ups were made to the cohort in order to increase the response rate. For each follow up, the non respondents were selected from the contacts database and an email was composed and sent to the trainees with a copy of the questionnaire attached. The final 3 follow-ups included a letter from Professor Heard and offered 5 randomly selected trainees the opportunity to receive a further simulation training session if they completed and returned the 'Real Incident' questionnaire.

There is little doubt that the response rate, particularly for the cohort, was very disappointing. There are many potential reasons why this was so low and some possible explanations include:

- **Questionnaire fatigue** – Foundation trainees are subjected to a high rate of questionnaires through both local and national research as attempts are made to evaluate the new training courses.
- **MTAS issues –** Although F1 trainees were not directly affected by the MTAS problems, there is little doubt that the current climate is uncertain for trainees and that leads to disinterest in research.
- General disengagement as a profession
- **Time** – The response rate was markedly better when the data were collected at the training sessions than when the trainees were contacted by email and asked to complete the questionnaires independently, when pressures on time are considerable.

5 DEMOGRAPHICS

This section outlines the demographic data for both the cohort and control group. Demographic data were collected in the pre-training questionnaire for the cohort and the parallel baseline questionnaire for the control group.

5.1 Training Centre (cohort only)

Of the 164 completed questionnaires, 31 trainees had attended simulation training at Bart's and The London (19%), 58 at St George's (35%) and 75 at Chelsea and Westminster (46%).

5.2 Deanery (control group only)

Of the 69 completed and returned questionnaires from the control group, 44 of the trainees were located in the Wessex deanery (64%), 18 were from the Eastern Deanery (26%), 6 were from 'other' deaneries (9%) and 1 trainee failed to identify which deanery they were located in (1%).

5.3 Age

All trainees were asked to select their age from pre-categorised answers. Table 2 shows that the majority of trainees from both the cohort and control group were aged 24 or 25 years (59%).

Table 2. Age

Age	Cohort (%)	Control (%)	Total
23 or less	10 (6)	8 (11)	18
24	50 (30)	25 (36)	75
25	46 (28)	16 (23)	62
26	16 (10)	7 (10)	23
27-30	19 (12)	10 (15)	29
More than 30	8 (5)	3 (5)	11
Missing	15 (9)	0	15
Total	**164 (100%)**	**69 (100%)**	**233**

5.4 Sex

51% (n=83) of the cohort sample was female and 40% (n=68) was male (13 missing responses).

Of the control group, 59% (n=53) was female and 41% was male.

5.5 Nationality

Table 3. Nationality

Nationality	Cohort (%)	Control (%)	Total
British	129 (79)	53 (77)	182
EU	10 (6)	6 (9)	16
Outside EU	12 (7)	10 (14)	22
Missing	13 (8)	0 (0)	13
Total	**164 (100%)**	**69 (100%)**	**233**

The majority of the sample (78%) in both groups described their nationality as British.

5.6 Medical course

All trainees were asked to state if they had qualified in the UK, European Union (EU) or abroad but outside the EU.

Table 4. Attended medical school

Where attended medical school	Cohort (%)	Control (%)	Total
UK	142 (86)	58 (84)	200
EU	4 (2)	5 (7)	9
Outside EU	5 (3)	6 (9)	11
Missing	13 (9)	0	13
Total	**164 (100%)**	**69 (100%)**	**233**

The majority of trainees from both groups attended medical school in the UK. 84% (n=137) of the cohort had completed an undergraduate medical course, while only 8% (n=13) had completed a graduate medical course (14 missing responses).

Similarly, 84% (n=58) of the control group trainees had completed an undergraduate medical course, while only 16% had completed a graduate course.

5.7 Conclusion

The demographic data presented above show that the characteristics of the cohort and control group are comparable. Trainees are a similar age,

they undertook similar medical courses, are similar nationalities and there is almost the same distribution of male and female trainees in both groups.

We can therefore, conclude that their training experiences prior to the simulation training will be similar, allowing for differences in curricula at medical school.

6 PREVIOUS SIMULATION TRAINING:

For the purpose of analysis, the trainees in the cohort who had received the combined pre and post questionnaire (n=17) via email, have been incorporated into one group with the majority of the cohort trainees (n=164) . Where they did not have the opportunity to answer a specific question, there answers are recorded as missing.

The cohort trainees were asked about other simulation training they had experienced, prior to the simulation training day. For the control group, the trainees were also asked about simulation training, prior to recruitment to the study.

The table below identifies the number and percentage of trainees who have experienced each type of simulation training. The majority of trainees have experienced more than one type of training.

Table 5. Previous simulation training

Previous Simulation training:	Cohort (%)	Control (%)	Total (%)
Clinical skills training using models	129 (79)	65 (94)	194 (83)
Communication skills using actors	140 (85)	61 (88)	201 (86)
Clinical encounter with Simulated patients	120 (73)	52 (75)	172 (31)
Clinical scenario with Mannequin	88 (54)	39 (57)	127 (55)
Multiprofessional simulation of scenarios	53 (32)	41 (59)	94 (40)
Other Simulation	18 (11)	5 (7)	23 (10)

As the trainees included in this study are Foundation Year 1 trainees, it is inferred from the question that previous simulation training refers to training experienced in medical school. The table above demonstrates that previous simulation training is very similar between both groups.

The only exception to this is that the control group has experienced more 'multi-professional simulation of scenarios'. However, this does not relate to simulation with mannequins but specific role play in a multi-professional environment.

From the demographics above and the results identified in previous simulation training, we can conclude that the cohort and control group are very similar in both characteristics and prior experience of simulation training.

PART TWO:

IMMEDIATE EFFECTS OF THE SIMULATION TRAINING DAY

7 DID THE SIMULATION TRAINING DAY HAVE ANY IMMEDIATE EFFECT?

7.1 Experience and confidence of specific emergencies pre- and post training

In order to ascertain the effectiveness of the training day on the cohort, we selected the cohort trainees from the dataset and analysed their confidence rating for each type of emergency, comparing their pre simulation training confidence rating with post training confidence.

Table 6 illustrates the number and percentage of cohort trainees who had experienced each type of emergency prior to the training day.

Table 6. Experience of each type of emergency

Type of Emergency	Cohort (%)
Respiratory	52 (32)
Cardiovascular	62 (38)
Gastrointestinal	40 (18)
Genitourinary	47 (29)
Neurological	35 (21)
Metabolic	31 (19)
Infectious	46 (28)
Multiple Trauma	23 (14)
Other	13 (8)

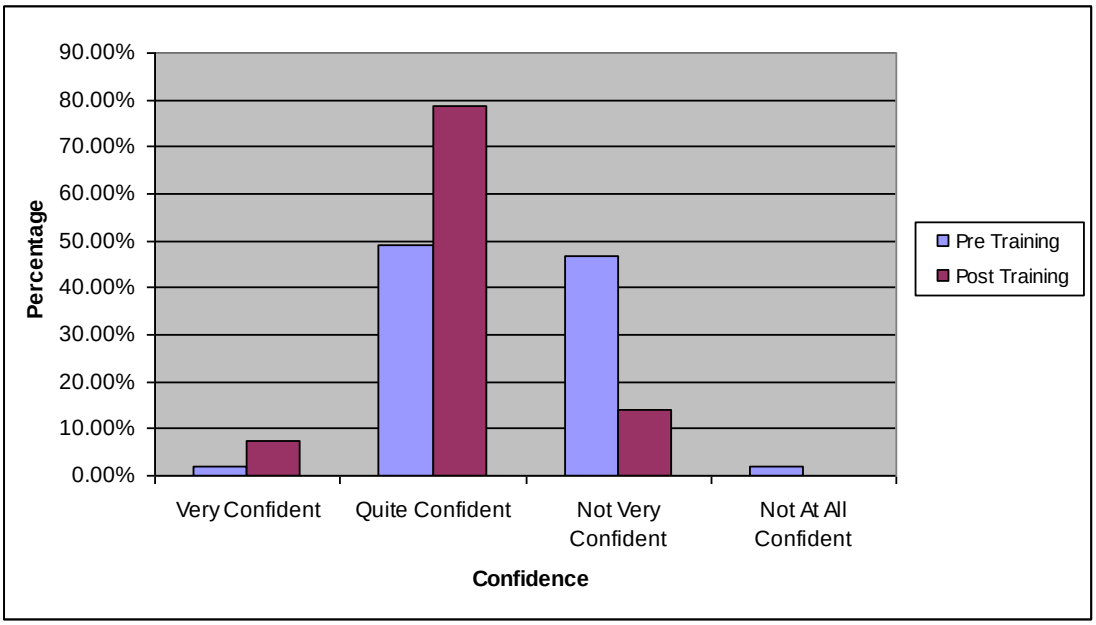
7.1.1 Respiratory

52 trainees in the cohort had been directly involved in the management of a respiratory emergency. Those trainees were asked to rate how confident they felt in their performance. Of the 52 trainees, only 49 rated their confidence.

Following the simulation training, all trainees were again asked to rate how confident they would feel in dealing with a respiratory emergency in the future. 137 trainees rated their confidence.

Figure 1 illustrates the confidence levels of the trainees showing both the pre-training confidence of experienced trainees and post training levels for all.

Figure 1. Confidence levels in dealing with a respiratory emergency.



	Very Confident	Quite Confident	Not Very Confident	Not At All Confident	Mean	SD	TOTALS
Pre-training	N=1 2.04%	N=24 48.98%	N=23 46.94%	N=1 2.04%	2.51	0.582	N=49 100.00%
Post-training	N=10 7.30%	N=108 78.83%	N=19 13.87%	N=0 0.00%	2.93	0.457	N=137 100.00%

It can be seen that the training day had some effect on improving the overall confidence of participants in dealing with respiratory emergencies. Importantly, the post-training day figure has improved the group as a whole beyond the level of confidence that the experienced group had derived from that experience alone.

We could there fore conclude that the concentrated experience in this area is more effective in its aim than experience alone.

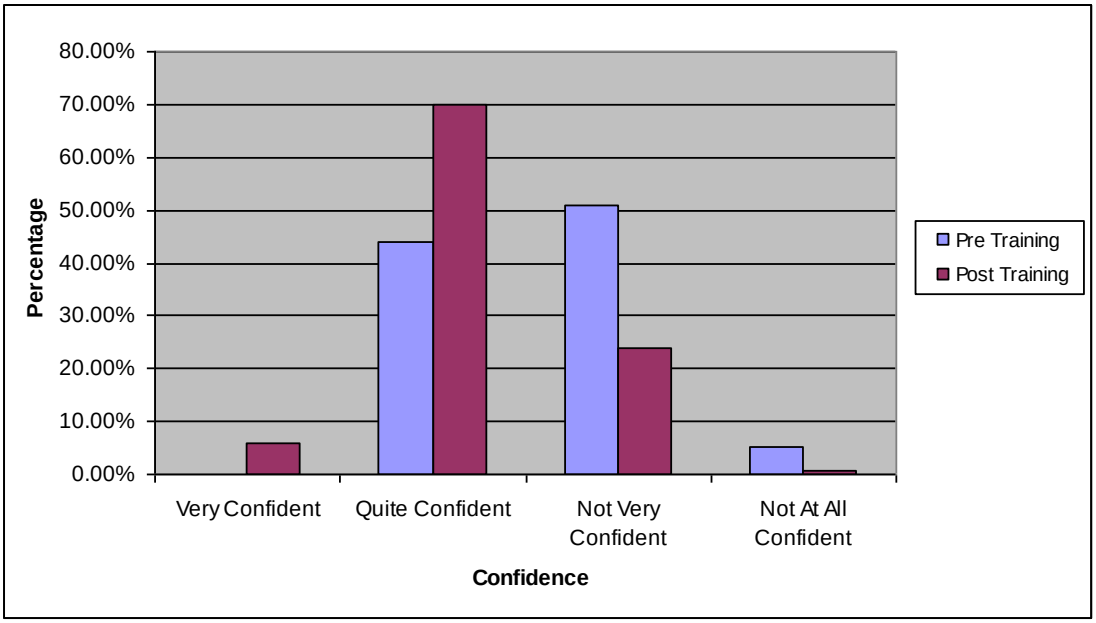
7.1.2 Cardiovascular

62 of the cohort had experienced a cardiovascular emergency, 57 of the 64 chose to rate their confidence in their performance.

Following the training, 139 cohort trainees rated their confidence in dealing with a cardiovascular emergency in the future.

The following figure shows that participants were slightly more confident in this area than in respiratory emergencies and that their confidence equally improved as a result of the training day.

Figure 2. Confidence levels in dealing with a cardiovascular emergency.



	Very Confident	Quite Confident	Not Very Confident	Not At All Confident	Mean	SD	TOTALS
Pre-training	0.00% 0	43.86% 25	50.88% 29	5.26% 3	2.39	0.590	100.00% 57
Post-training	5.76% 8	69.78% 97	23.74% 33	0.72% 1	2.81	0.537	100.00% 139

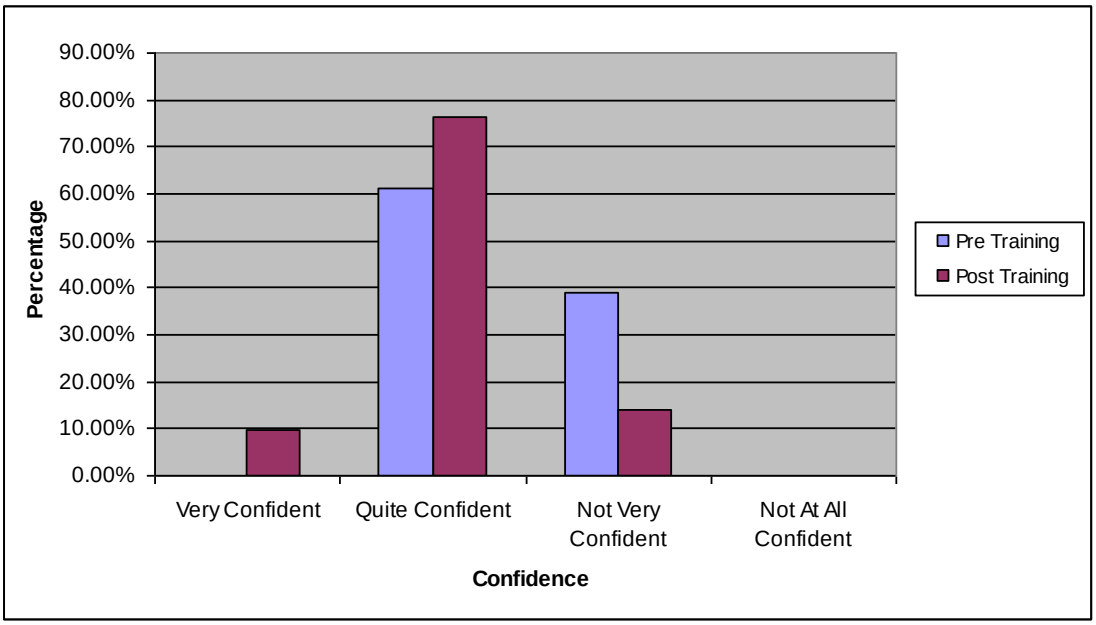
7.1.3 Gastrointestinal

40 trainees stated that they had previous experience in dealing with the management of a gastrointestinal emergency. Of the 40, 36 trainees rated their confidence in their performance.

Following the simulation training, 136 trainees rated their confidence in dealing with this emergency.

A very similar picture emerges of reasonable prior confidence among those with experience, which is slightly improved on across the board the training day.

Figure 3. Confidence levels in dealing with a gastrointestinal emergency



	Very Confident	Quite Confident	Not Very Confident	Not At All Confident	Mean	SD	TOTALS
Pre-training	0.00% 0	61.11% 22	38.89% 14	0.00% 0	2.61	0.494	100.00% 36
Post-training	9.56% 13	76.47% 104	13.97% 19	0.00% 0	2.96	0.485	100.00% 136

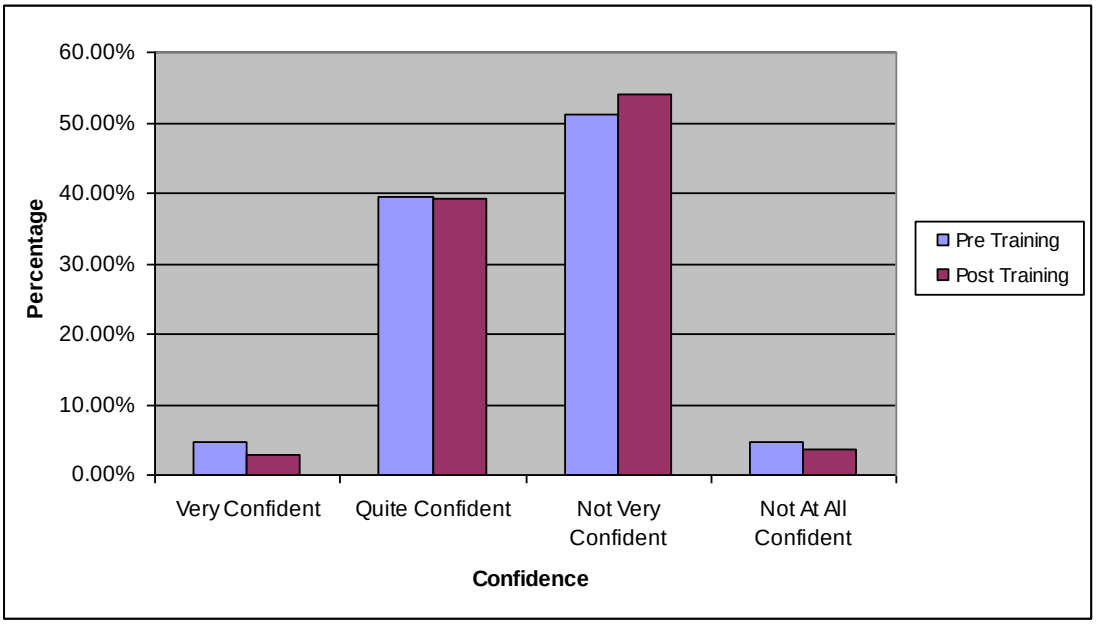
7.1.4 Genitourinary

47 trainees stated that they had experienced a genitourinary emergency and 43 rated their confidence in dealing with it prior to the simulation training. Following the training, 135 rated their confidence in dealing with a genitourinary emergency in the future.

Figure 4 shows that trainees with prior experience were less confident than they were for respiratory, gastrointestinal and cardiovascular topics. More than half were not very confident. After training, again a different picture emerged of trainees who were still largely not very confident. This is an important finding since specifically genitourinary topics were not addressed in the training day. We can conclude that the effects of that training tend to be case specific rather than generalisable – which would

be commensurate with our knowledge of assessment and clinical problem solving.

Figure 4. Confidence levels in dealing with a genitourinary emergency



	Very Confident	Quite Confident	Not Very Confident	Not At All Confident	Mean	SD	TOTALS
Pre-training	4.65% 2	39.53% 17	51.16% 22	4.65% 2	2.44	0.666	100.00% 43
Post-training	2.96% 4	39.26% 53	54.07% 73	3.70% 5	2.41	0.616	100.00% 135

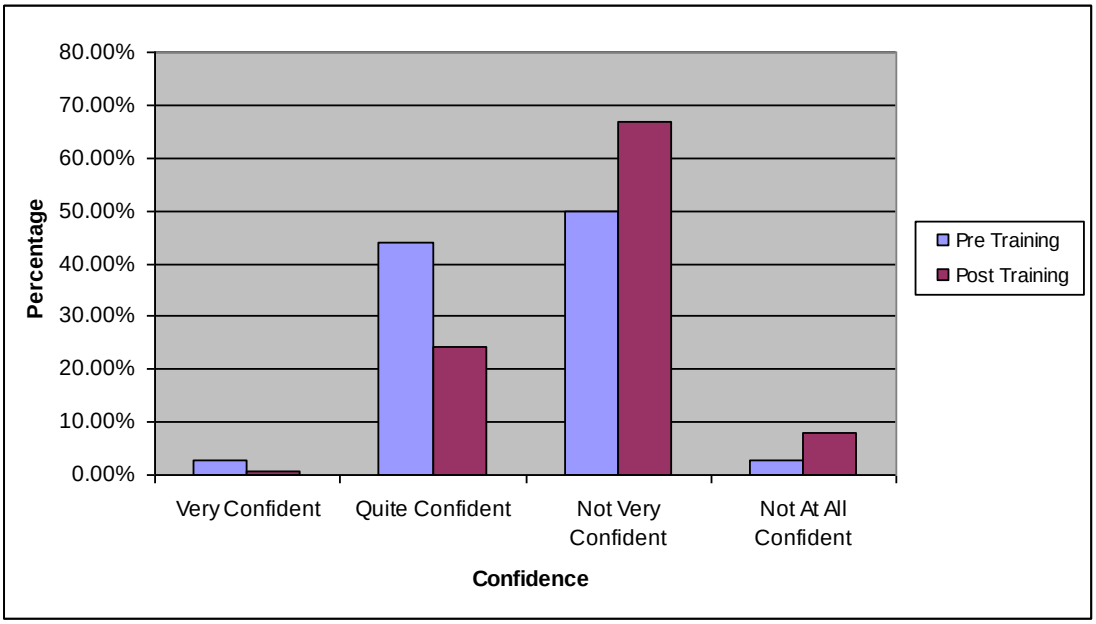
4.1.5 Neurological

Trainees were asked about their previous experience in dealing with a neurological emergency. 35 of the cohort had previous experience and 34 rated their confidence. Following the simulation training, 136 trainees rated their confidence in dealing with a neurological emergency in a real life setting.

Again, the effects of the training day were to decrease levels of confidence in participants. And again, the days had not focused on a neurological emergency. whether the day had given participants insight into the complexity of dealing with emergencies, or whether the increased confidence in other areas had made them feel less confident in areas that they had not been trained in, we cannot say. But the findings are

consistent with our knowledge of the case specificity of learning in medicine.

Figure 5. Confidence levels in dealing with a neurological emergency



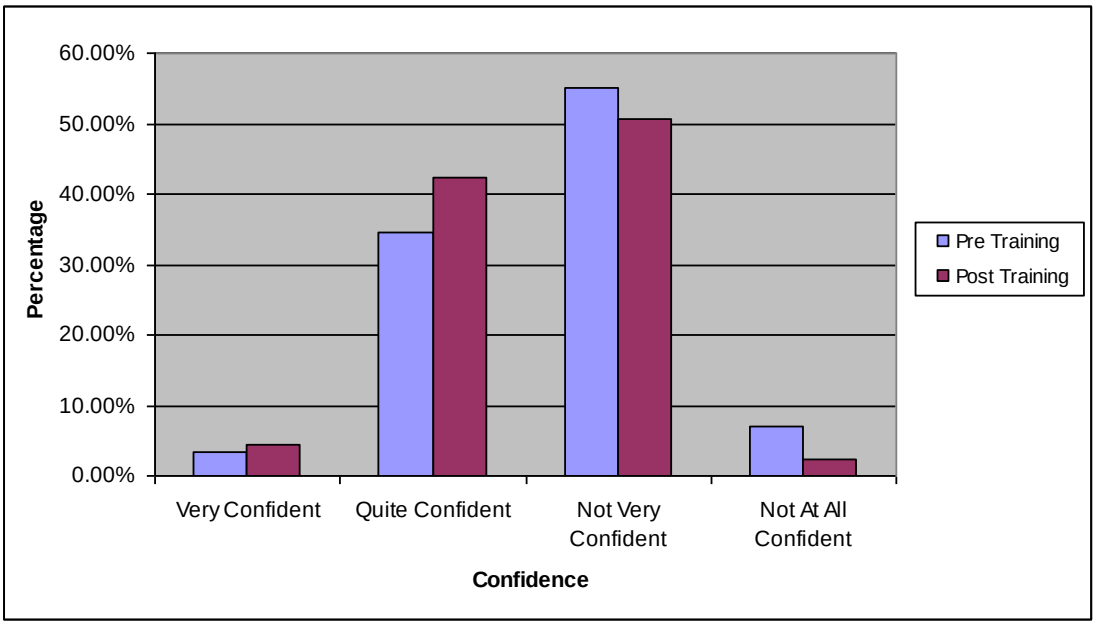
	Very Confident	Quite Confident	Not Very Confident	Not At All Confident	Mean	SD	TOTALS
Pre-training	2.94% 1	44.12% 15	50.00% 17	2.94% 1	2.47	0.615	100.00% 34
Post-training	0.74% 1	24.26% 33	66.91% 91	8.0911%	2.18	0.569	100.00% 136

7.1.5 Metabolic

Trainees were asked if they had previous experience in dealing with a metabolic emergency. 31 trainees stated they had and of those 31, 29 rated their confidence.

132 trainees rated their confidence in dealing with a metabolic emergency following the simulation training. It can be seen that although average levels of confidence rose slightly [from 2.34 to 2.49], most participants still felt not very confident. Again, this is likely to be an effect of case specificity.

Figure 6. Confidence levels in dealing with a metabolic emergency



	Very Confident	Quite Confident	Not Very Confident	Not At All Confident	Mean	SD	TOTALS
Pre-training	3.45% 1	34.48% 10	55.17% 16	6.90% 2	2.34	0.670	100.00% 29
Post-training	4.55% 6	42.42% 56	50.76% 67	2.27% 3	2.49	0.624	100. 13200%

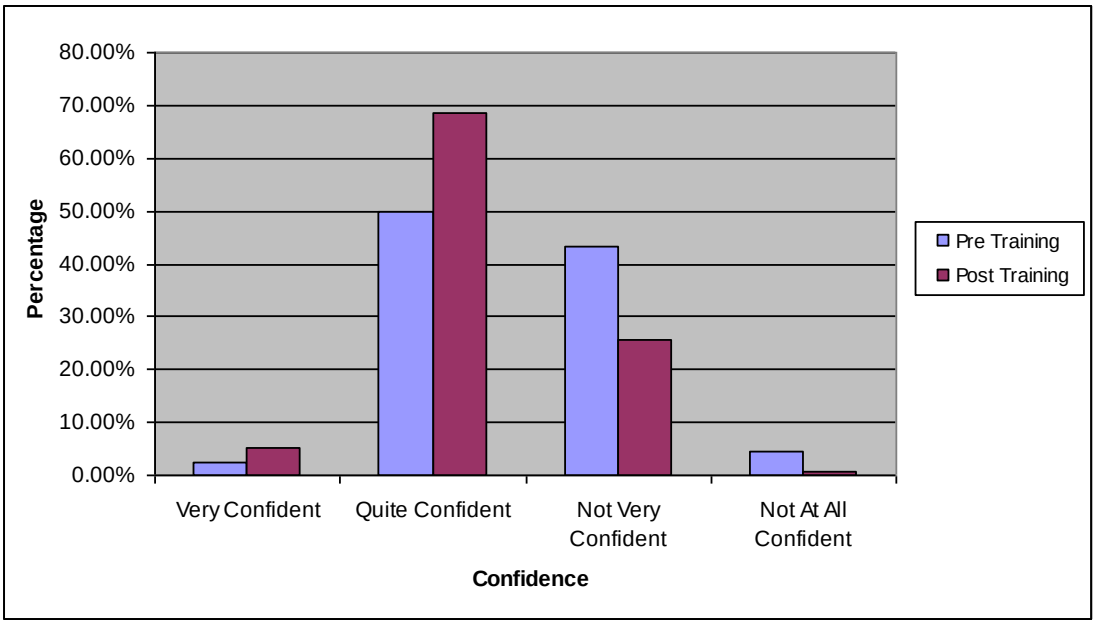
4.1.7 Infectious diseases

46 trainees stated that they had previous experience of dealing with the management of an infectious emergency. 44 trainees rated their confidence of their performance.

A total of 133 trainees in the cohort rated their future confidence in dealing with an infectious emergency following the simulation training.

It can be seen that confidence improved as a result of the training day. Given the SIMS scenario, the findings on this topic do reinforce the conclusion that case specificity is the basis of learning in this, as most other, circumstances in medicine.

Figure 7. Confidence levels in dealing with an infectious emergency

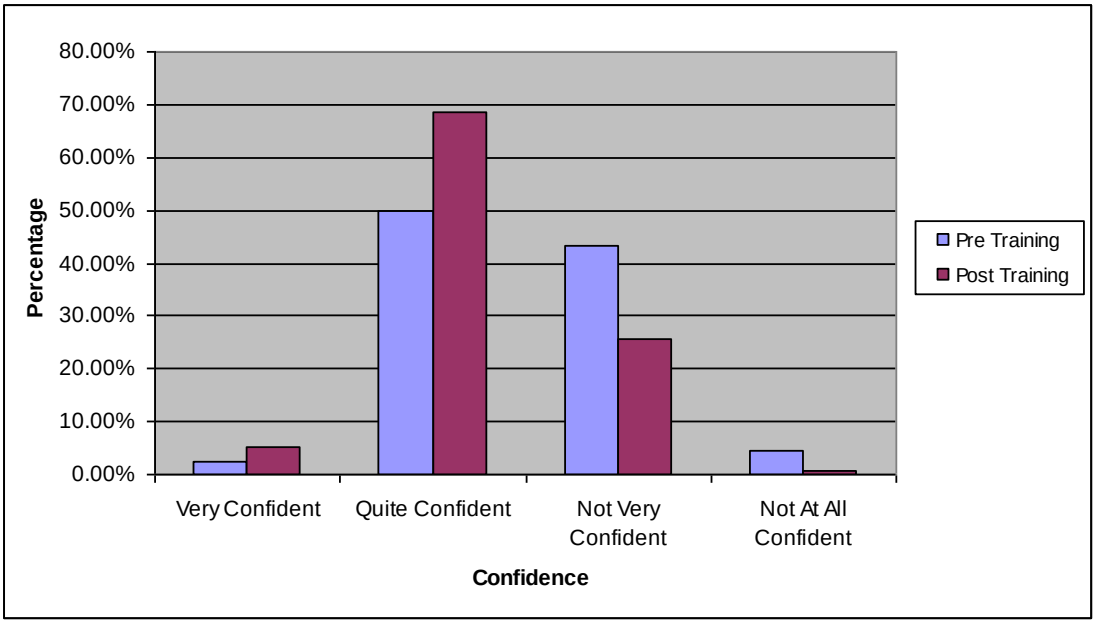


	Very Confident	Quite Confident	Not Very Confident	Not At All Confident	Mean	SD	TOTALS
Pre-training	2.27% 1	50.00% 22	43.18% 19	4.55% 2	2.50	0.629	100.00% 44
Post-training	5.26% 7	68.42% 91	25.56% 34	0.75% 1	2.78	0.541	100.00% 133

7.1.6 Multiple trauma

Only 23 trainees had experienced dealing with a multiple trauma and of those, 20 rated their confidence in their performance. 136 trainees rated their confidence in dealing with this type of emergency following the simulation training day. Figure 8 shows that confidence increased in this area possibly because of the complex nature of the scenarios offered.

Figure 8. Confidence levels in dealing with a multiple trauma



	Very Confident	Quite Confident	Not Very Confident	Not At All Confident	Mean	SD	TOTALS
Pre-training	2.27% 1	50.00% 22	43.18% 19	4.55% 2	2.35	0.489	100.00% 44
Post-training	5.26% 7	68.42% 91	25.56% 34	0.75% 1	2.08	0.597	100.00% 133

7.1.7 Other emergencies

Trainees were asked about other cases they had experienced that required ITU/CCU involvement. 18 cohort trainees stated they had experienced other such cases but only 7 stated what those cases were:

- Acute ischaemic limb
- Acute pulmonary oedema
- Severe peritonitis
- Perforated duodenal ulcer
- Sickle chest crisis
- Metabolic acidosis (cause unknown)
- Acute pancreatitis, obstruction and malnutrition.

The trainees were asked to rate their confidence in their performance. Of the 18, 1 said they were 'very confident', 7 'quite confident', 7'not very confident' and 2 were 'not at all confident'. 1 trainee did not rate their confidence.

7.2 Experience and confidence of specific tasks pre- and post training

Prior to undertaking the simulation training, trainees were asked to indicate any tasks they had performed in an emergency and how confident they felt in their performance.

Table 7 below, identifies the tasks involved and the number and percentage of cohort trainees who had performed them before the training took place. Tasks are rank ordered by frequency.

Table 7. Tasks performed

Task	Frequency (%)
Take bloods	81 (49.4)
Insert a cannula	80 (48.8)
Give oxygen	76 (46.3)
Always wear gloves	69 (42.1)
Call for help	68 (41.5)
ABC assessment	68 (41.5)
Apply monitoring	59 (36.0)
Always wash my hands	58 (35.4)
Give drugs and fluids	52 (31.7)
Verbalise possible diagnosis	39 (23.8)
Declare an emergency	35 (21.3)
Allocate tasks to team members	20 (12.2)
Verbalise your treatment plan	20 (12.2)
Maintain an overview	18 (11.0)
Defibrillate	14 (8.5)
Take a leadership role in a medical emergency	10 (6.1)
Organise the team	9 (5.5)
Take the lead role in a cardiorespiratory arrest or trauma case	8 (4.9)

The table shows clearly that tasks associated with team working are not the frequently reported ones.

As with the section above, in order to ascertain if the training had an effect on the trainees' confidence in performing these tasks, we compared

how they rated their confidence prior to the training with how they rated their confidence following the training. The results for each task are presented below.

The following sections show that in some tasks confidence, on average, improved while in other tasks, confidence decreased, as follows:

Table 8. Pre- and post-changes in confidence in undertaking specific tasks

TASK	Increase	Decrease
Take bloods		
Insert a cannula		
Give oxygen		
Always wear gloves		
Call for help		
ABC assessment		
Apply monitoring		
Always wash my hands		
Give drugs and fluids		
Verbalise possible diagnosis		
Declare an emergency		
Allocate tasks to team members		
Verbalise your treatment plan		
Maintain an overview		
Defibrillate		
Take a leadership role in a medical emergency		
Organise the team		
Take the lead role in a cardiorespiratory arrest or trauma case		
TOTAL	16	2

We can look at each of these in detail.

The following array of figures presents the overall picture of levels of confidence per task before and after the training. The subsequent table presents the data associated with these diagrams.

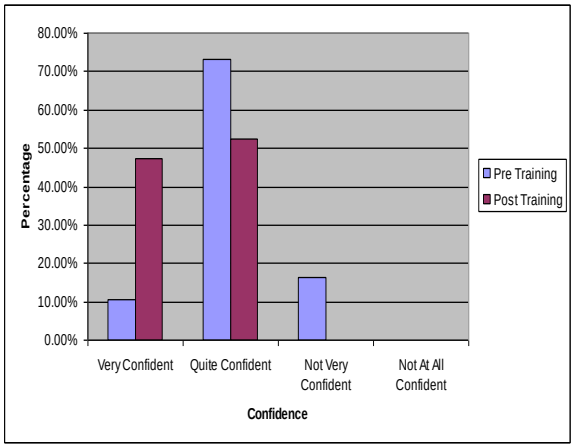
It can be seen that:

- Where there was a decrease in confidence [in glove wearing and hand washing], the pre-training scores had been nearing the maximum and the decrease was minimal, suggesting no real change.

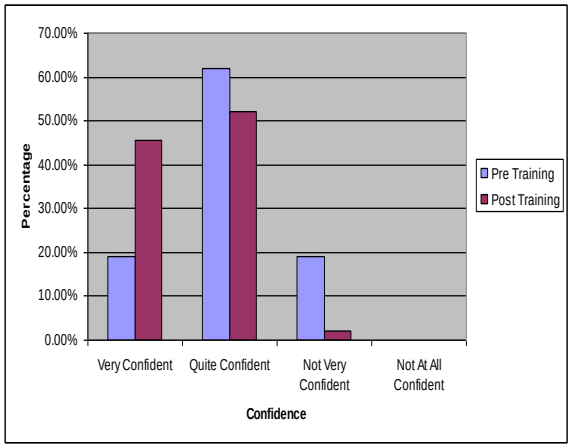
- The greatest increase [of 18%] was observed in the areas that had the lowest pre-training score [Taking a lead role in a cardiorespiratory arrest or trauma].
- Four of the 5 areas showing greatest increase were in areas of general professional skill [taking a lead role, maintaining an overview, verbalising a diagnosis]
- In 10 of the 15 areas, the standards deviation decreased after training implying a movement towards similar standards of achievement across the groups.
- The minimal observed change in the key skills of calling for help [0%] and declaring an emergency [2%] must be interpreted in the light of the relatively high pre-training scores. The post-training average score for calling for help was nearly at the maximum [3.57].
- Overall, the figures suggest that trainees entered the course with relatively high confident in most areas and that the training demonstrated added value in both lower and higher scoring areas in both professional and clinical domains.

Figure 9. Overview of pre- and post-training confidence levels

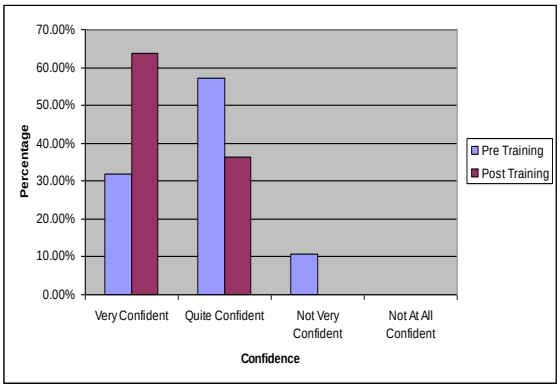
Confidence levels in performing an ABC assessment



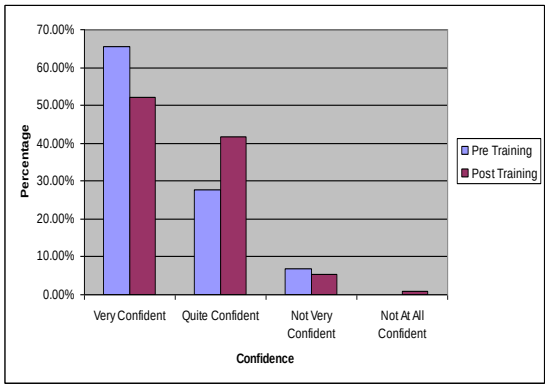
Confidence levels in applying monitoring



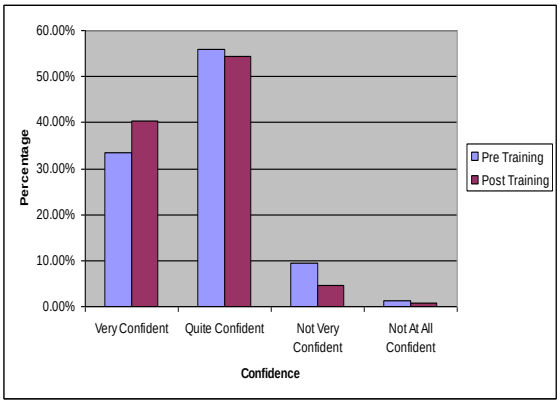
Confidence levels in giving oxygen



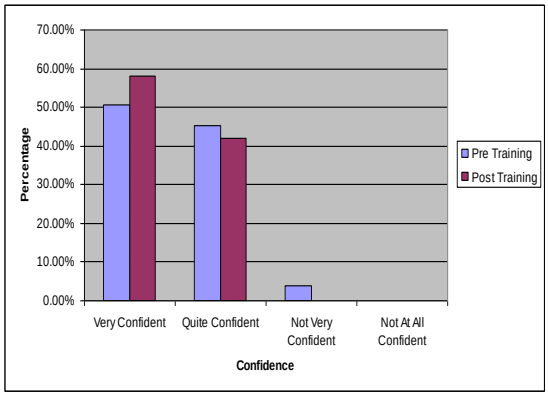
Confidence levels in washing hands



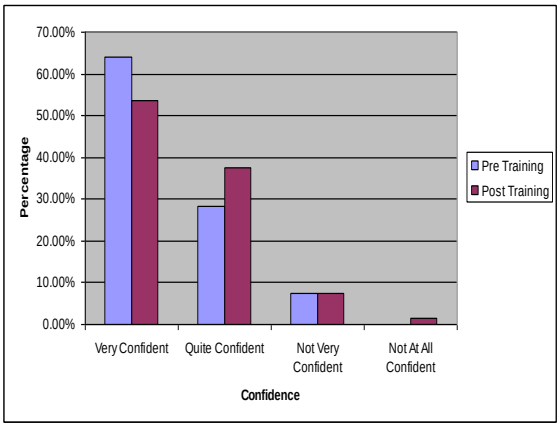
Confidence levels in inserting a cannula



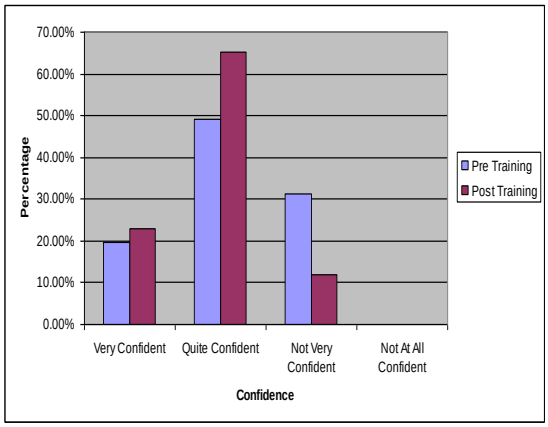
Confidence levels in taking bloods



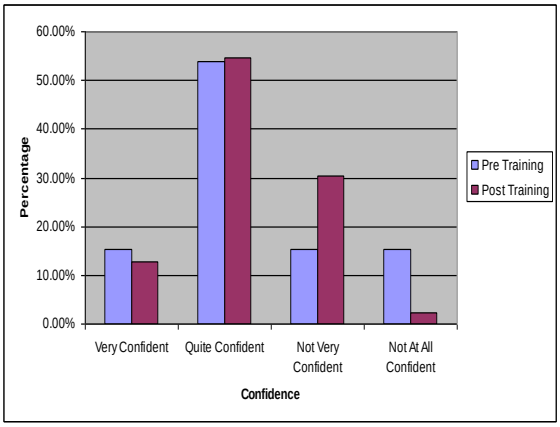
Confidence levels in wearing gloves



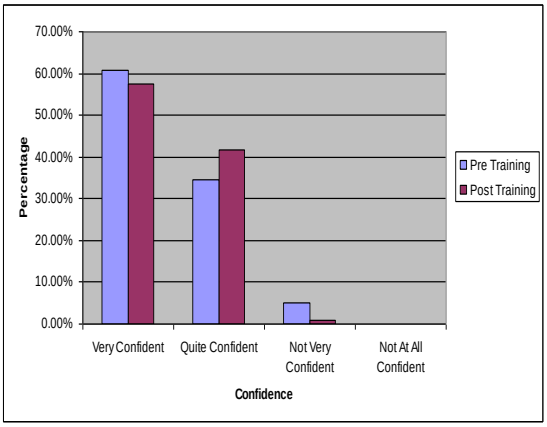
Confidence levels in giving drugs and fluids



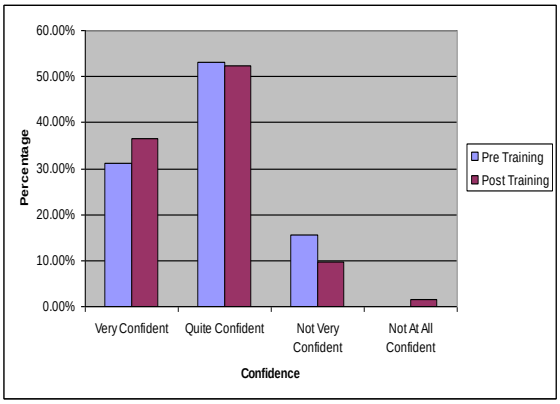
Confidence levels in defibrillating



Confidence levels in calling for help



Confidence levels in declaring an emergency



Confidence levels in verbalising a possible diagnosis

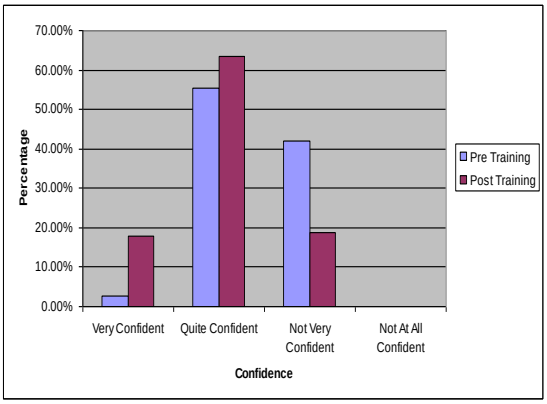


Figure 10. Confidence levels in allocating tasks to other team members

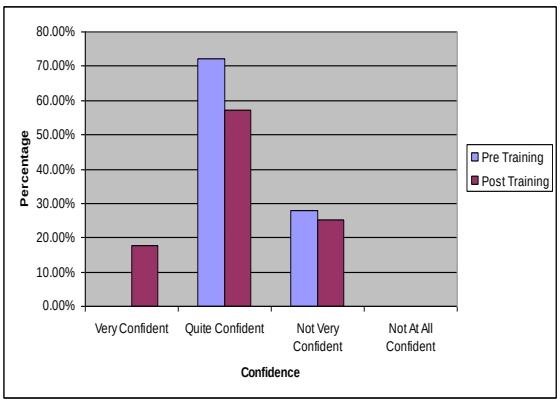
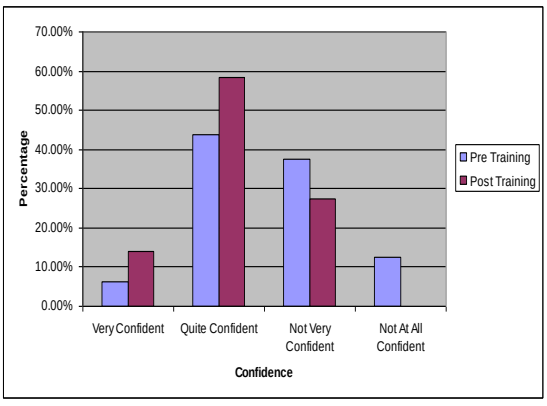
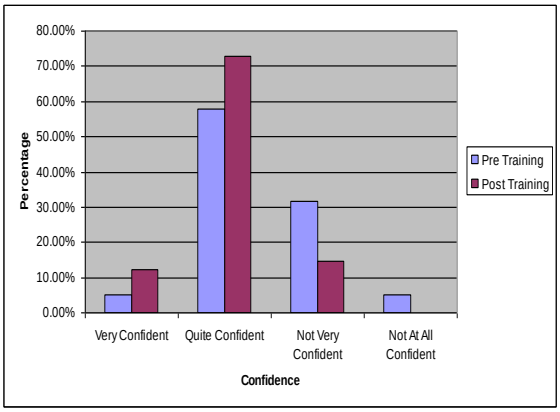


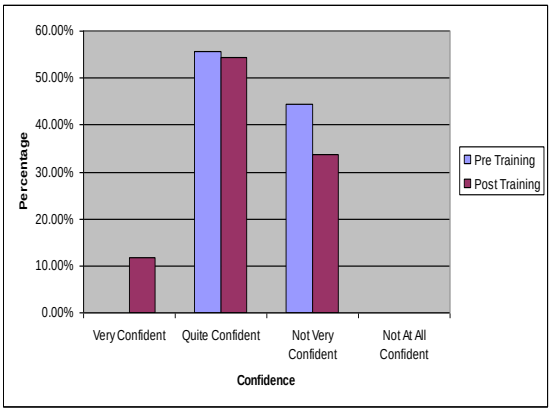
Figure 11. Confidence levels in maintaining an overview



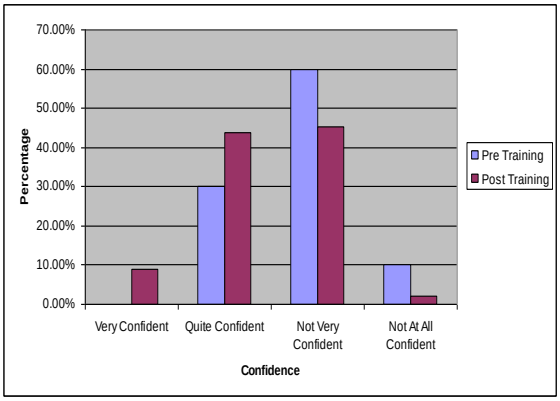
Confidence levels in verbalising your treatment plan



Confidence levels in organising the team



Confidence levels in taking a leadership role in a medical emergency.



Confidence levels in taking a leadership role in a cardiorespiratory trauma

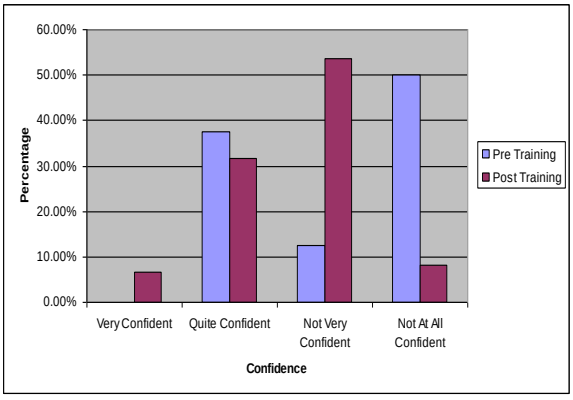


Table 9. Pre-training and post training means and standards deviations per task

Task	Pre-training		Post-training		Difference between means	% change
	Mean	SD	Mean	SD		
Taking a lead role in a cardiorespiratory arrest or trauma	1.88	0.991	2.37	0.728	+ 0.49	+ 26%
ABC assessment	2.94	0.519	3.47	0.501	+ 0.53	+ 18%
Maintain an overview	2.44	0.814	2.87	0.632	+ 0.43	+ 18%
Taking a leadership role in a medical emergency	2.20	0.632	2.59	0.683	+ 0.39	+ 18%
Verbalising a possible diagnosis	2.61	0.547	2.99	0.607	+ 0.38	+ 15%
Apply monitoring	3.00	0.621	3.43	0.501	+ 0.43	+ 14%
Give oxygen	3.21	0.622	3.64	0.483	+ 0.43	+ 13%
Verbalise your treatment plan	2.63	0.684	2.98	0.521	+ 0.35	+ 13%
Giving drugs and fluids	2.88	0.711	3.11	0.582	+ 0.23	+ 8%
Organising the team	2.56	0.527	2.78	0.640	+ 0.22	+ 8%
Allocate tasks to team members	2.72	0.461	2.93	0.654	+ 0.21	+ 8%
Insert a cannula	3.21	0.664	3.34	0.602	+ 0.13	+ 4%
Taking bloods	3.47	0.577	3.58	0.495	+ 0.11	+ 3%
Defibrillate	2.69	0.947	2.78	0.691	+ 0 09	+ 3%
Declaring an emergency	3.16	0.677	3.24	0.685	+ 0.08	+ 2%
Calling for help	3.56	0.592	3.57	0.512	+ 0.01	+ 0%
Always wear gloves	3.57	0.633	3.43	0.696	- 0.14	- 4%
Always wash hands	3.59	0.622	3.46	0.633	- 0.13	- 4%

7.3 Calling for help pre- and post-training

Prior to undertaking the simulation training, trainees were asked how likely they were to call for help in certain circumstances:

- When you cannot get a line in
- Patient is breathless
- Patient needs 60% oxygen
- Patient is blue and breathless
- Oxygen saturations are below 94%
- When the patient needs 40% oxygen
- When the patient's respiratory rate is 38 BPM
- When the patient's heart rate is above 100 BPM
- When the patients blood pressure is below 100 systolic

- Respiratory arrest
- Cardiac arrest

Following the training day, the cohort was asked the same question, how likely were they to call for help in the future in certain circumstances. In order to ascertain the effect of the training day, we have compared below the results for pre and post simulation training for each of the 11 circumstances.

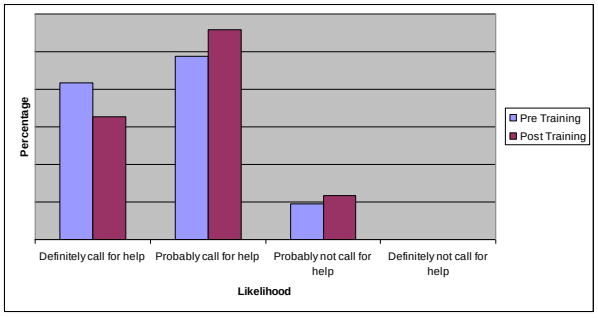
Looking at the figures below, we can see that::

- Trainees already were already likely to call for help in the cases of cardiac and respiratory arrest, and blue and breathless patient, so here little change could be expected as a result of the training day.
- All observed changes were small, none exceeding 8%
- Pre-training trainees were more likely to call for help in every circumstance than not to call for help.

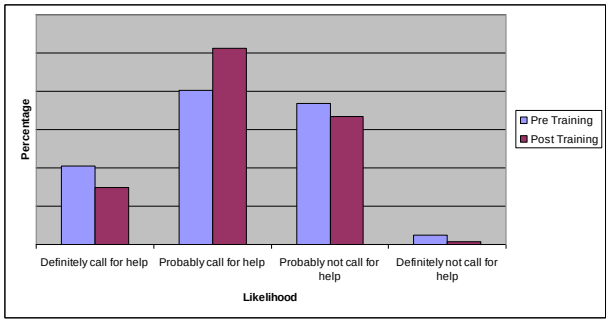
In these areas, therefore, the training day was likely to have a reinforcing effect rather than one which actually seemed likely to change behaviour.

Figure 12. Overview of likelihood of calling for help

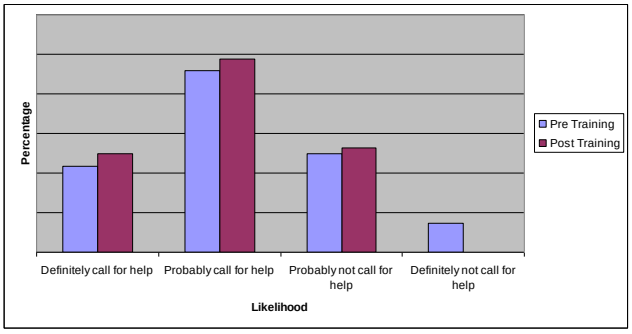
Likelihood of calling for help when cannot get a line in



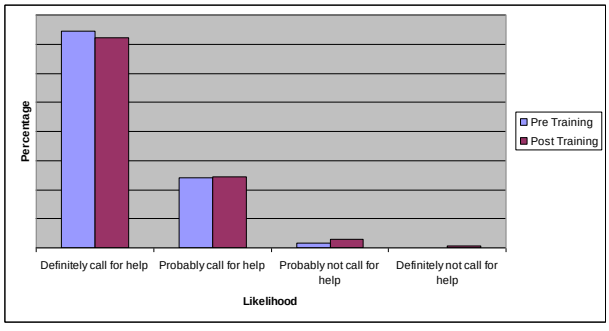
Likelihood of calling for help when a patient is breathless



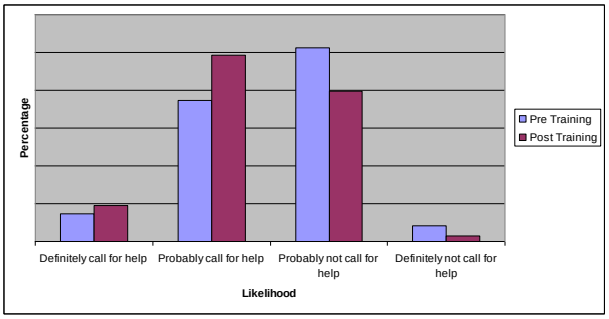
Likelihood of calling for help when patient needs 60% oxygen



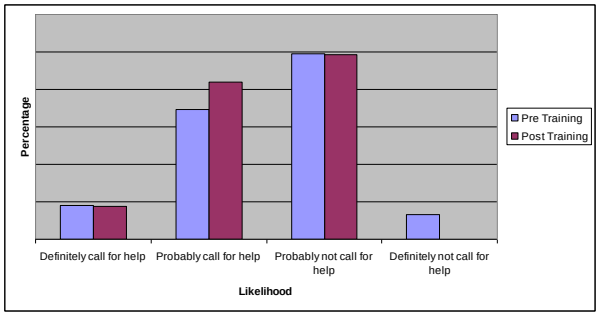
Likelihood of calling for help when patient is blue and breathless.



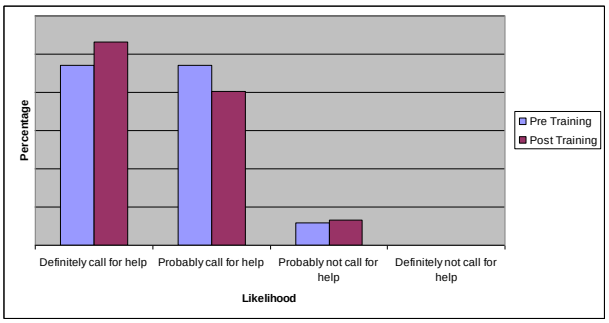
Likelihood of calling for help when oxygen saturations are below 94%



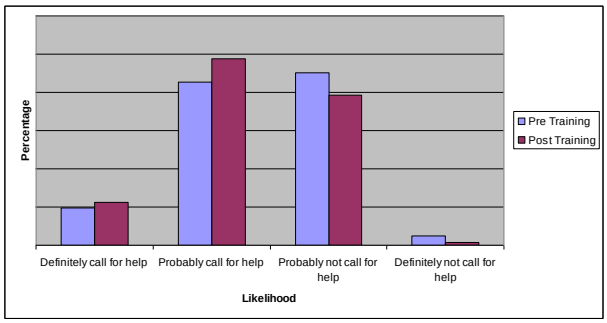
: Likelihood of calling for help when the patient needs 40% oxygen



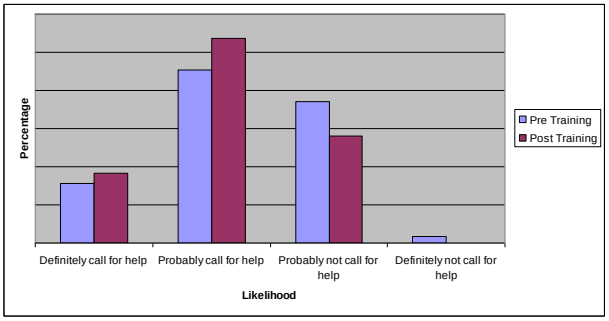
Likelihood of calling for help when the patient's respiratory rate is 38BPM



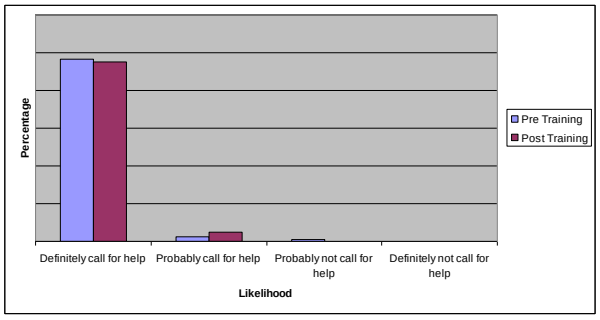
Likelihood of calling for help when the patient's heart rate is above 100BPM



Likelihood of calling for help when the patient's blood pressure is below 100 systolic



Likelihood of calling for help when the patient is having a respiratory arrest



Likelihood of calling for help when the patient is having a cardiac arrest

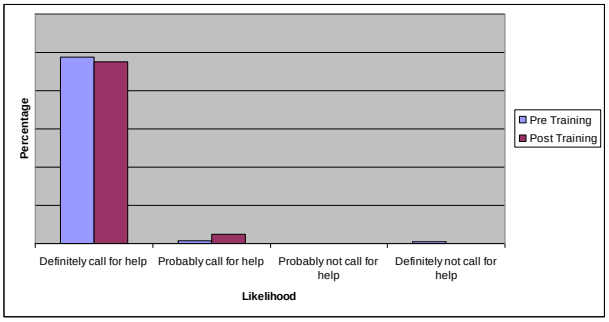


Table 10. Pre-training and post training means and standards deviations per circumstance

Circumstance	Pre-training		Post-training		Difference between means	% change
	Mean	SD	Mean	SD		
When you cannot get a line in	3.31	0.64	3.21	0.63	+ 0.1	+ 3%
Patient is breathless	2.79	0.80	2.80	0.69	+ 0.01	+ 4%
Patient needs 60% oxygen	2.82	0.86	2.96	0.72	+ 0.14	+ 5%
Patient is blue and breathless	3.73	0.48	3.68	0.57	- 0.05	+ 1.5%
Oxygen saturations are below 94%	2.48	0.69	2.67	0.67	+ 0.19	+ 7.7%
When the patient needs 40% oxygen	2.46	0.75	2.59	0.65	+ 0.13	+ 5.3
When the patient's respiratory rate is 38 BPM	3.41	0.60	3.17	0.62	- 0.24	- 7%
When the patient's heart rate is above 100 BPM	2.60	0.7	2.70	0.67	+ 0.10	+ 3.8%
When the patients blood pressure is below 100 systolic	2.75	0.73	2.90	0.68	+ 0.15	+ 5.5%
Respiratory arrest	3.95	0.31	3.95	0.22	No change	
Cardiac arrest	3.96	0.29	3.95	0.22	- 0.01	- 0.3%

7.4 Factors affecting decisions to call for help

Trainees were given a series of statements relating to their decisions to call for help and the factors that may affect their decisions. They were

asked if they ‘strongly agreed’, ‘agreed’, ‘disagreed’ or ‘strongly disagreed’ with each statement. The possible factors tested were:

- I am happy to call for help whenever I need it
- I am less likely to call for help if my immediate senior is busy in clinic/theatre
- I am happy to call for help at 2pm
- I don’t always call for help because I feel that I should be able to cope myself
- If I don’t know the diagnosis I’m reluctant to call for help straight away
- I am happy to call for help at 4am
- I sometimes don’t know whom to call
- I like to get all the basic investigations done first before I call for help
- I am less likely to call for help if my immediate senior is non-resident
- I am less likely to call for help if I have been previously criticised by my immediate senior for doing so
- I am happy to call for help at 7am
- I’m not sure what I am expected to cope with before calling for help
- I am less likely to call for help as a result of simulation training

The following figures and table show the pre- and post-training results. It can be seen that¨

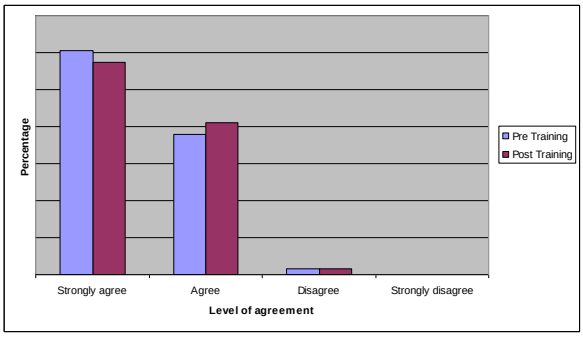
- Trainees in general are happy to call for help at any time
- There is little change in their overall willingness to call for help
- Simulation training, as intended, did not make them any less likely to call for help

Points that might need addressing in future training are that there is a tendency for trainees to:

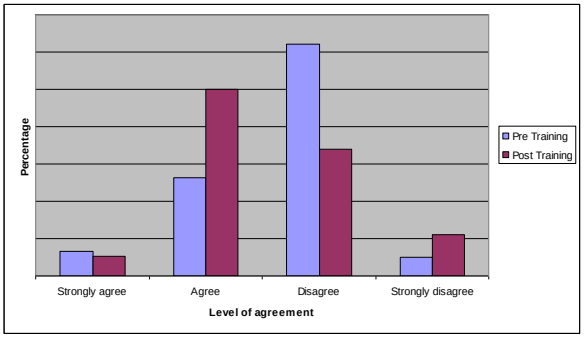
- be reluctant to call for help if they do not know the diagnosis
- feel that they should be able to cope
- not disturb a senior who is not resident or occupied in a clinic

Figure 13. Overview of factors affecting decisions to call for help

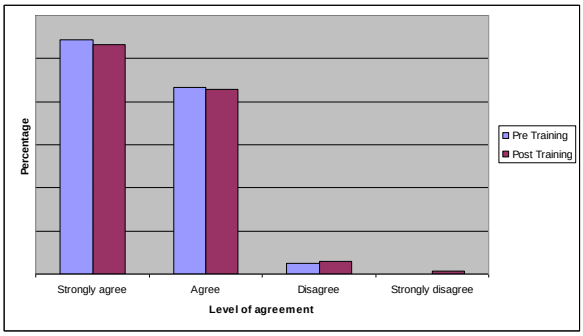
"I am happy to call for help whenever I need it"



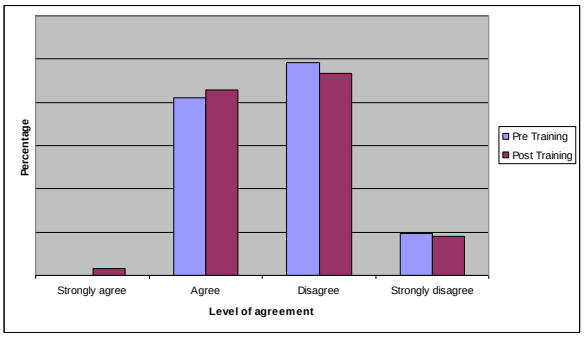
"I am less likely to call for help if my immediate senior is busy in clinic /theatre"



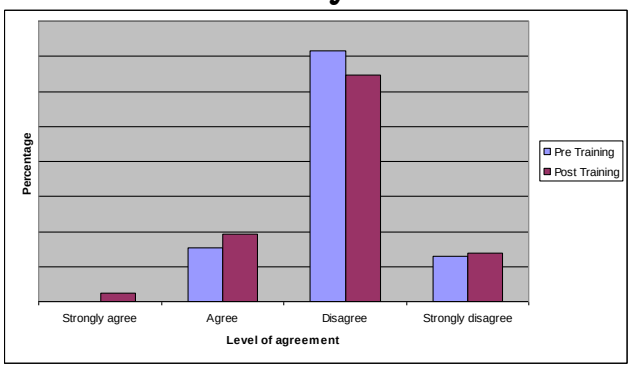
"I am happy to call for help at 2pm".



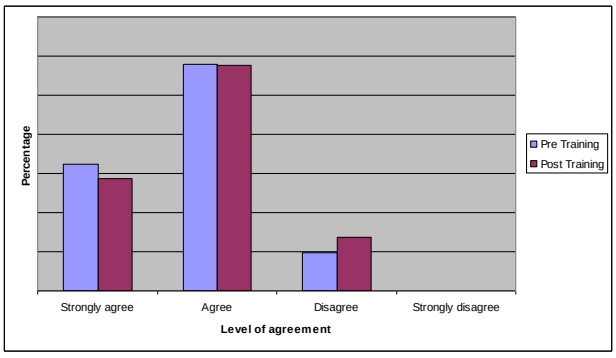
"I don't always call for help because I feel that I should be able to cope myself".



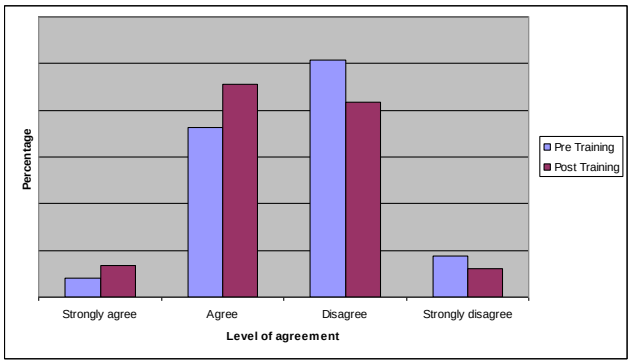
"If I don't know the diagnosis I am reluctant to call for help straight away"



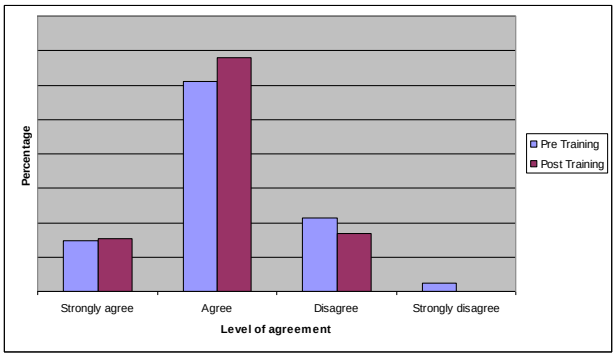
"I am happy to call for help at 4am".



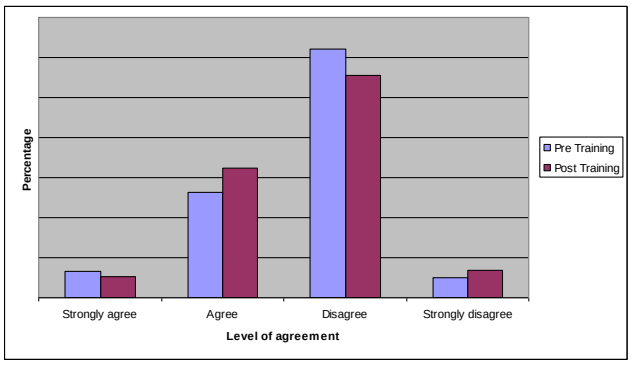
“I sometimes don’t know whom to call”.



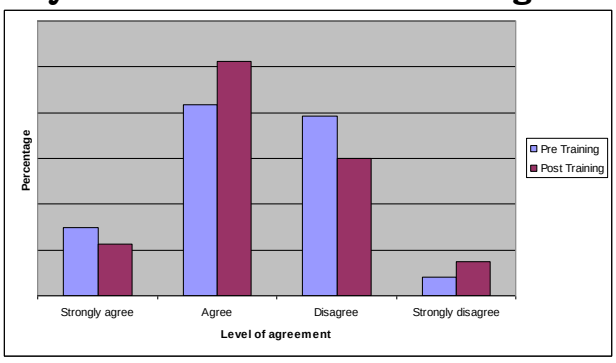
“I like to get all the basic investigations done first before I call for help”



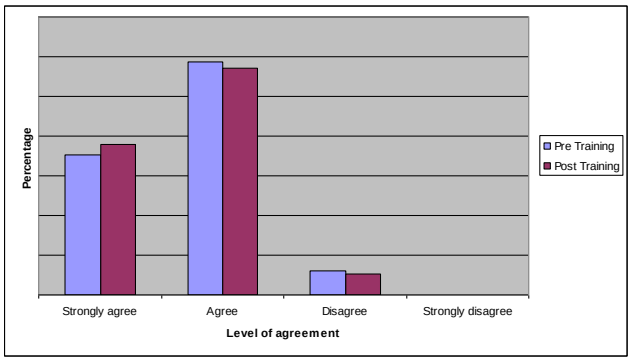
“I am less likely to call for help if my immediate senior is non-resident”.



“I am less likely to call for help if I have been previously criticised by my immediate senior for doing so.”



“I am happy to call for help at 7am”.



“I am not sure what I am expected to cope with before calling for help”.

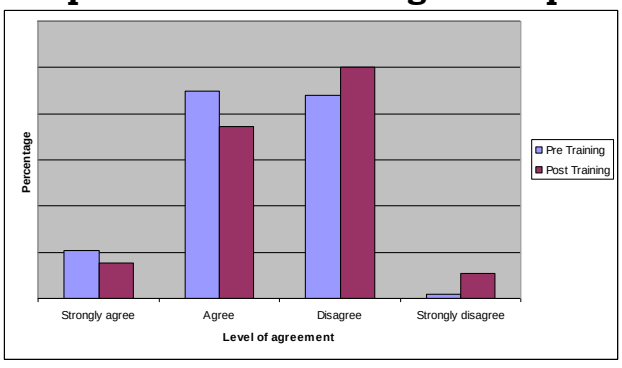


Table 11. Pre-training and post training means and standards deviations per factor in calling for help

Factor	Pre-training		Post-training		Difference between means	% change
	Mean	SD	Mean	SD		
I am happy to call for help whenever I need it	3.59	0.53	3.56	0.53	-0.03	-0.8%
I am less likely to call for help if my immediate senior is busy in clinic/theatre	2.42	0.64	2.51	0.76	+0.09	+3.7%
I am happy to call for help at 2pm	3.52	0.55	3.49	0.60	-0.03	-0.8%
I don't always call for help because I feel that I should be able to cope myself	2.69	0.64	2.63	0.67	-0.06	-2.2%
If I don't know the diagnosis I'm reluctant to call for help straight away	2.98	0.54	2.90	0.65	-0.08	-2.7%
I am happy to call for help at 4am	3.23	0.61	3.15	0.64	-0.08	-2.5%
I sometimes don't know whom to call	2.65	0.70	2.47	0.72	-0.18	-6.8%
I like to get all the basic investigations done first before I call for help	2.12	0.76	2.02	0.57	-0.10	-4.7%
I am less likely to call for help if my immediate senior is non-resident	2.65	0.68	2.64	0.69	-0.01	-0.4%
I am less likely to call for help if I have been previously criticised by my immediate senior for doing so	2.32	0.78	2.34	0.78	+0.02	+0.86%
I am happy to call for help at 7am	3.29	0.58	3.33	0.57	+0.04	+1.2%
I'm not sure what I am expected to cope with before calling for help	2.35	0.67	2.53	0.72	+0.18	+7.6%
I am less likely to call for help as a result of simulation training	2.82	0.79	2.80	0.81	-0.02	-0.7%

PART THREE:

BASELINE COMPARISONS OF COHORT AND CONTROL GROUPS

8 IS THE CONTROL GROUP THE SAME BEFORE TRAINING AS THE COHORT?

8.1 Experience of emergencies

It is important to determine if the experience and confidence of the control group is the same as that of the cohort before simulation training took place. In order to achieve this we compared the experience and confidence of both groups using the pre training data.

Table 12, below, outlines the number of control trainees who experienced each type of emergency in comparison with the cohort trainees. It can be seen that the control group were considerably more experienced in every type of emergency than the cohort group. However, the actual level of experience of each emergency is relatively low in each group with less than one third of the cohort experiencing all but one type of emergency [cardiovascular] and fewer than 50% of the control group experiencing all but two types [respiratory and cardiovascular]. This must be taken into account when interpreting findings.

Table 12. Number and percentage of trainees who had experience of each type of emergency.

Type of Emergency	Cohort (%)	Control (%)
Respiratory	52 (32)	36 (52)
Cardiovascular	62 (38)	42 (61)
Gastrointestinal	40 (18)	27 (39)
Genitourinary	47 (29)	30 (43)
Neurological	35 (21)	34 (49)
Metabolic	31 (19)	31 (45)
Infectious	46 (28)	31 (45)
Multiple trauma	23 (14)	12 (17)
Other	13 (8)	5 (7)

Respondents were invited to say how confident they felt in their performance in each of the emergencies listed. The following numbers of trainees gave their judgments.

Table 13. Numbers of trainees rating their confidence

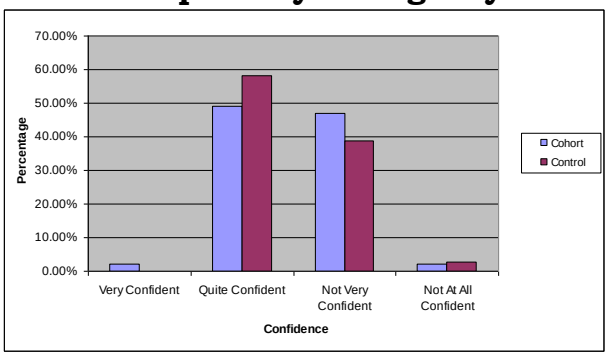
Emergency	Cohort		Control	
	No. experienced	No. rated confidence	No. experienced	No. rated confidence
Respiratory	52	49 [94%]	36	36 [100%]
Cardiovascular	62	57 [92%]	42	41[98%]
Gastrointestinal	40	36 [90%]	27	27 [100%]
Genitourinary	47	43 [91%]	30	30 [100%]
Neurological	35	32 [91%]	34	32 [94%]
Metabolic	31	29[94%]	31	31 [100%]
Infectious	46	44 [96%]	31	31 [100%]
Multiple trauma	23	20 [87%]	12	11 [92%]

8.2 Baseline confidence comparisons in specific emergencies

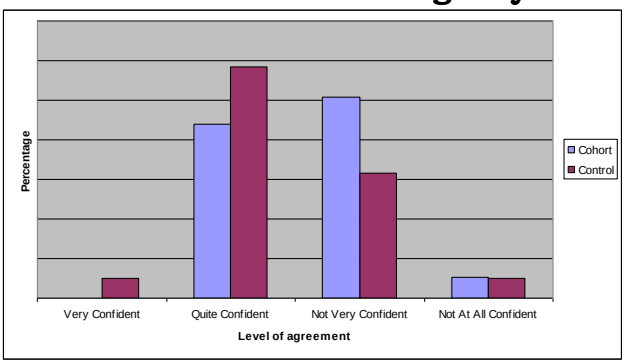
The following figures and table show that in general, both groups were moderately confident in their ability to deal with all the traumas listed with the more experienced controls being marginally more confident than the cohort group in six of the eight emergencies.

Figure 14. Overview of baseline confidence comparisons in specific emergencies

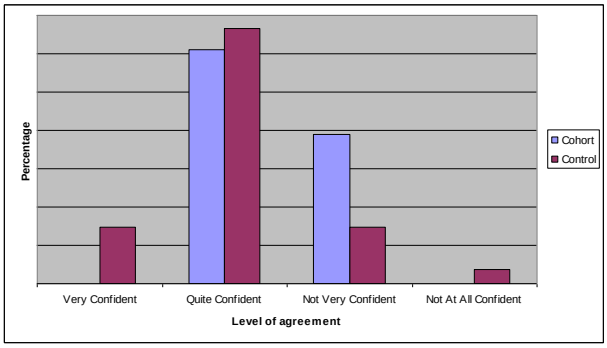
Confidence levels in dealing with a respiratory emergency



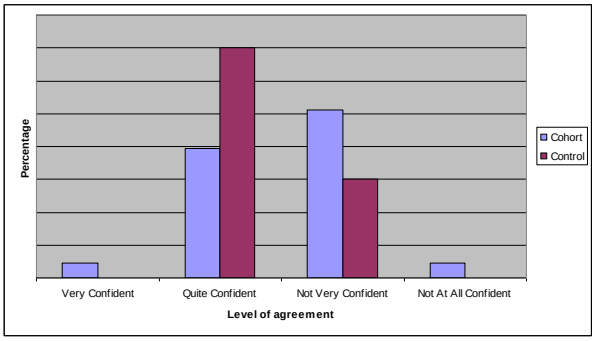
Confidence levels in dealing with a cardiovascular emergency



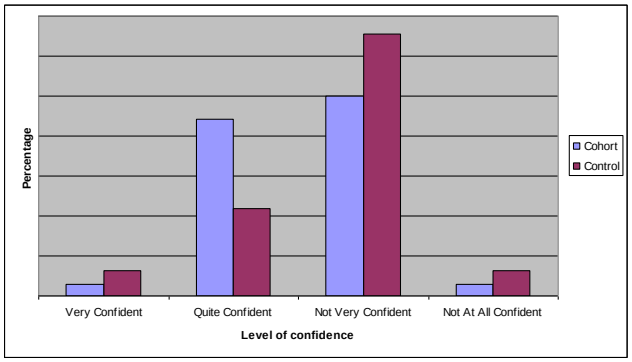
Confidence levels in dealing with a gastrointestinal emergency



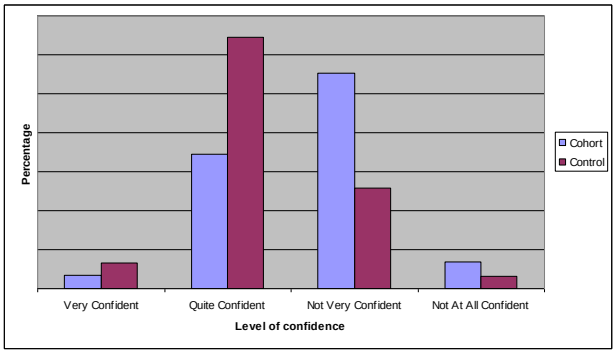
Confidence levels in dealing with a genitourinary emergency



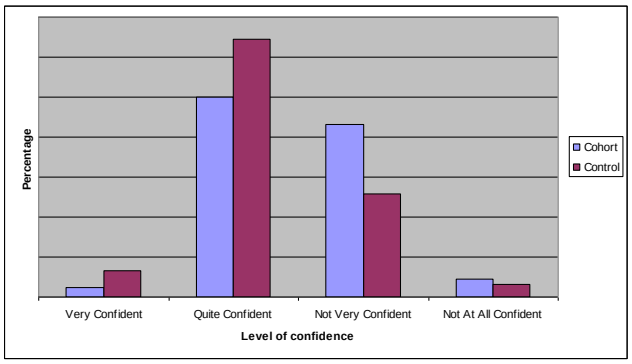
Confidence levels in dealing with a neurological emergency



Confidence levels in dealing with a metabolic emergency



Confidence levels in dealing with an infectious emergency



Confidence levels in dealing with a multiple trauma

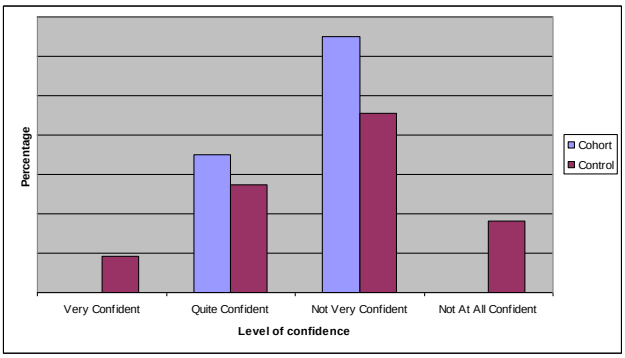


Table 14. Baseline confidence levels of cohort and control groups in emergencies

Emergency	Cohort		Control		Difference between means [shading = rating in favour of cohort]
	Mean	SD	Mean	SD	
Respiratory	2.51	0.58	2.56	0.56	0.04
Cardiovascular	2.39	0.59	2.63	0.66	0.24
Gastrointestinal	2.61	0.50	2.93	0.68	0.32
Genitourinary	2.44	0.67	2.70	.047	0.26
Neurological	2.47	0.62	2.28	0.68	0.19
Metabolic	2.34	0.67	2.58	0.56	0.24
Infectious	2.50	0.63	2.74	0.63	0.24
Multiple trauma	2.35	0.49	2.27	0.91	0.08

8.3 Experience of tasks

Trainees were asked to record any tasks that they had performed in an emergency and indicate how confident they felt in their performance.

Table 15 below presents the number and percentage of trainees for both the cohort and control group who had performed each task.

Table 15. Number and percentage of trainees who had experience of each task.

Task	Cohort Frequency (%)	Control Frequency (%)
ABC assessment	68 (41.5)	49 (71.0)
Apply monitoring	59 (36.0)	37 (53.6)
Give oxygen	76 (46.3)	51 (73.9)
Always wash my hands	58 (35.4)	44 (63.8)
Insert a cannula	80 (48.8)	48 (69.6)
Take bloods	81 (49.4)	52 (75.3)
Always wear gloves	69 (42.1)	48 (69.6)
Give drugs and fluids	52 (31.7)	36 (52.1)
Defibrillate	14 (8.5)	9 (13.0)
Call for help	68 (41.5)	46 (66.6)
Declare an emergency	35 (21.3)	28 (40.5)
Verbalise possible diagnosis	39 (23.8)	29 (42.0)
Allocate tasks to team members	20 (12.2)	16 (23.1)
Maintain an overview	18 (11.0)	15 (21.7)
Verbalise your treatment plan	20 (12.2)	23 (33.3)
Organise the team	9 (5.5)	9 (13.0)
Take a leadership role in a medical emergency	10 (6.1)	8 (11.6)
Take the lead role in a cardiorespiratory arrest or trauma case	8 (4.9)	4 (5.8)

Again, the control group were more experienced than the cohort in all tasks. Table 16 shows the number of respondents rating their confidence in these tasks.

Table 16. Number of trainees rating their confidence

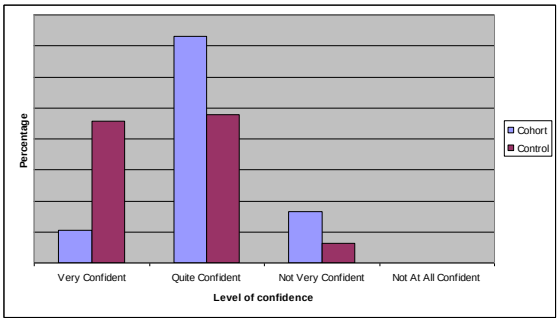
	Cohort		Control	
	No. experienced	**No. rated confidence**	**No. experienced**	**No. rated confidence**
ABC assessment	68	67 [98%]	49	48 [98%]
Apply monitoring	59	58 [98%]	37	35 [95%]
Give oxygen	76	75 [99%]	51	49 [96%]
Always wash my hands	58	58 [100%]	44	42 [95%]
Insert a cannula	80	75 [94%]	48	47 [98%]
Take bloods	81	75 [93%]	52	50 [96%]
Always wear gloves	69	67 [97%]	69	45[65%]
Give drugs and fluids	52	51[98%]	36	35 [97%]
Defibrillate	14	13[93%]	9	9 [100%]
Call for help	68	61 [90%]	46	45 [98%]
Declare an emergency	35	32 [91%]	28	27 [96%]
Verbalise possible diagnosis	39	38 [97%]	29	28 [96%]
Allocate tasks to team members	20	16 [80%]	18	15 [83%]
Maintain an overview	18	16 [89%]	15	15 [100%]
Verbalise your treatment plan	20	19 [96%]	23	22 [96%]
Organise the team	9	9 [100%]	9	9 [100%]
Take a leadership role in a medical emergency	10	10 [100%]	8	8 [100%]
Take the lead role in a cardiorespiratory arrest or trauma case	8	8 [100%	4	4 [100%]

8.4 Baseline confidence comparisons in performing tasks

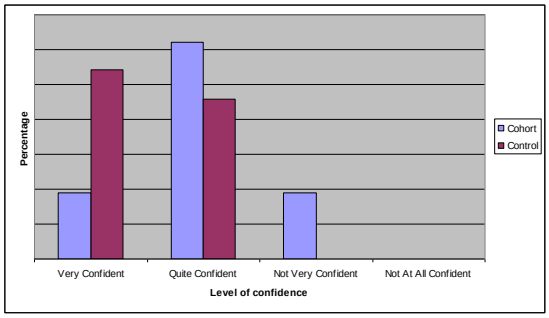
The following figures and table show that both groups were already confident in all tasks other than the cohort group which was not confident to take the lead role in a cardiorespiratory arrest or trauma case.

Figure 15. Overview of baseline confidence comparisons in performing tasks

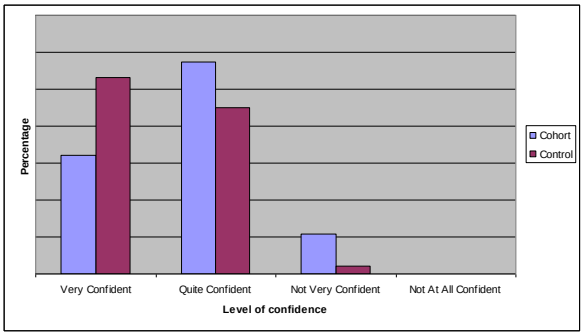
Confidence in performing an ABC assessment



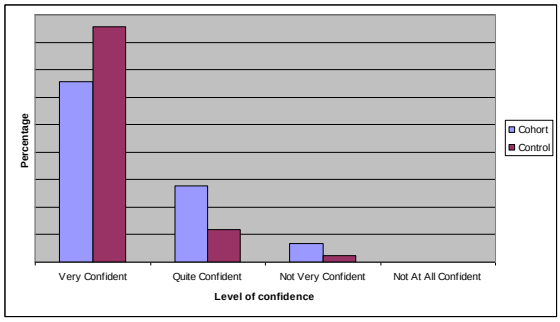
Confidence in applying monitoring



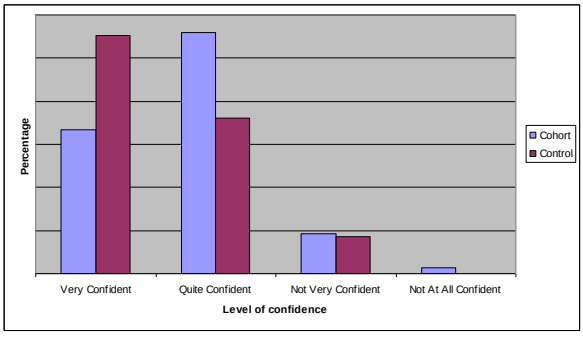
Confidence in giving oxygen



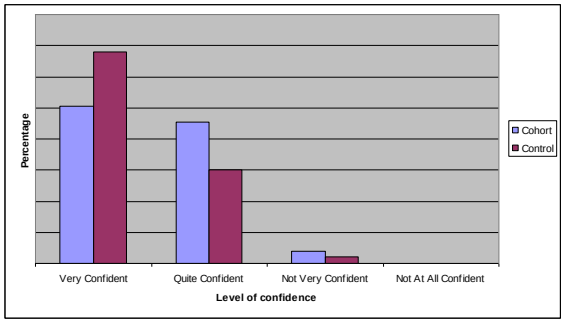
Confidence in always washing hands



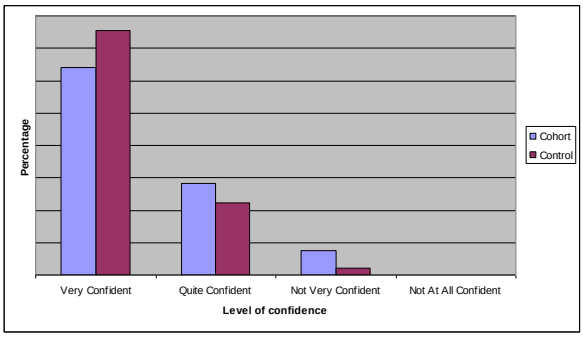
Confidence in inserting a cannula



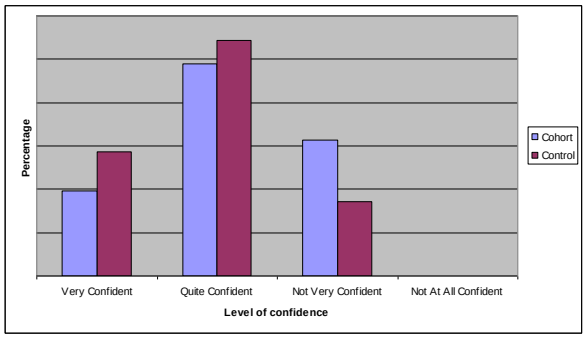
Confidence in taking bloods



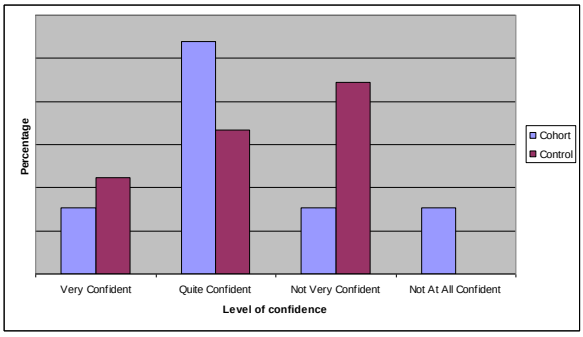
Confidence in wearing gloves



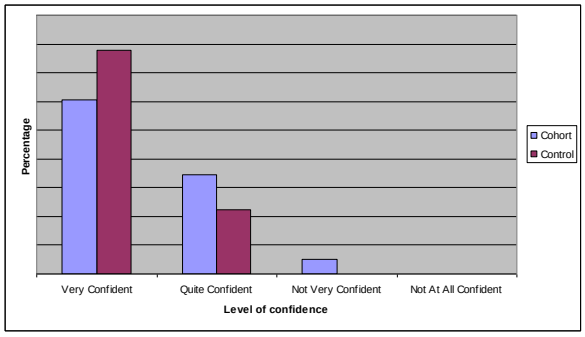
Confidence in giving drugs and fluids



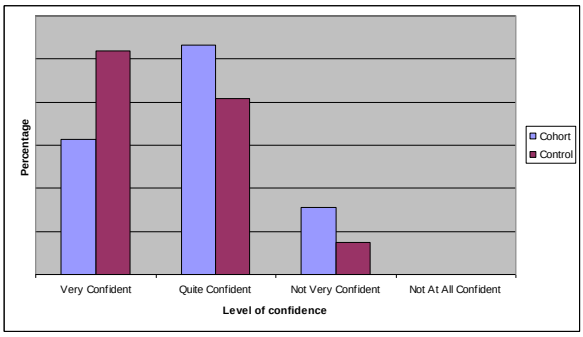
Confidence in performing a defibrillation



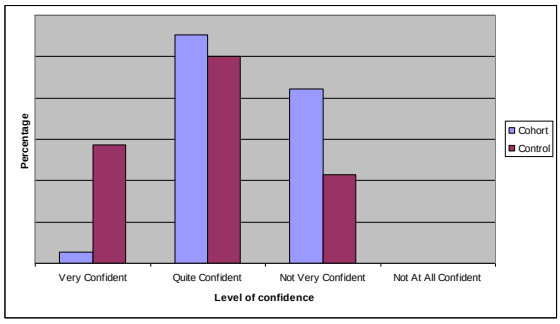
Confidence in calling for help



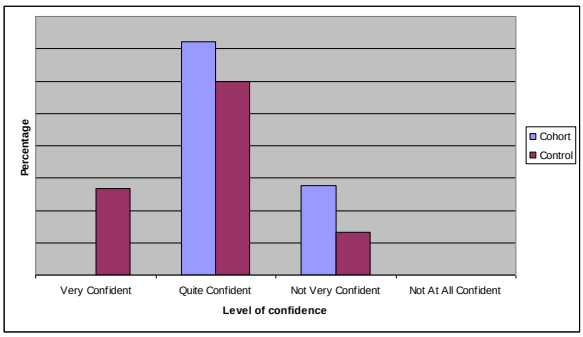
Confidence in declaring an emergency



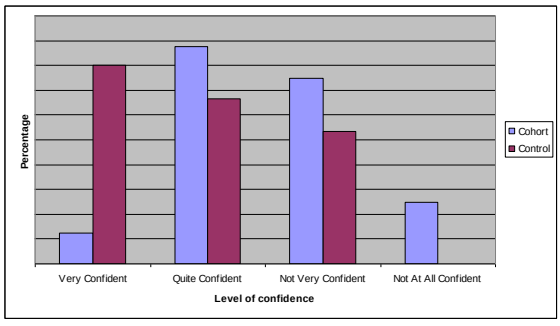
Confidence in verbalising a diagnosis



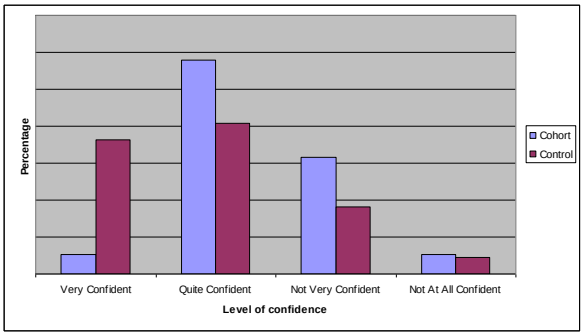
Confidence in allocating tasks



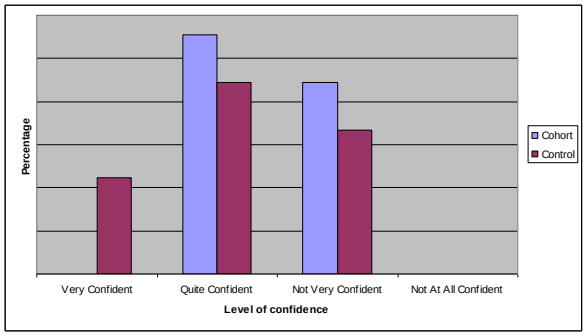
Confidence in maintaining an overview



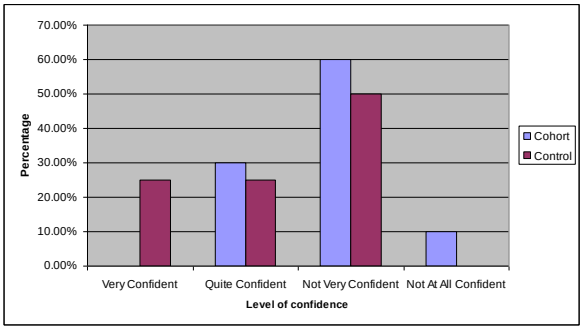
Confidence in verbalise a treatment plan



Confidence in organising the team



Confidence in taking a lead role



Confidence in taking a lead role in a cardiorespiratory arrest or trauma

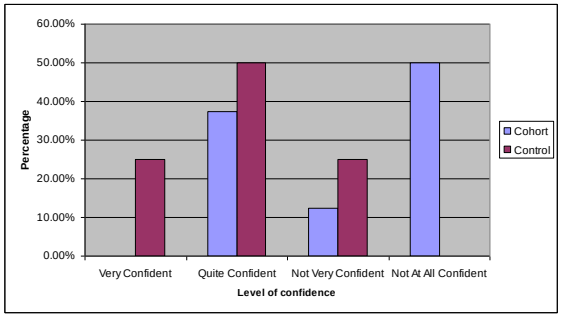


Table 17. Baseline confidence levels of cohort and control groups in tasks

Task	Cohort		Control		Difference between means [shading = rating in favour of cohort
	Mean	SD	Mean	SD	
ABC assessment	2.94	0.52	3.40	0.61	0.46
Apply monitoring	3.0	0.62	3.54	0.51	0.54
Give oxygen	3.21	0.62	3.51	0.55	0.3
Always wash my hands	3.59	0.62	3.83	0.44	0.24
Insert a cannula	3.21	0.66	3.34	0.60	0.13
Take bloods	3.47	0.58	3.66	0.52	0.19
Always wear gloves	3.57	0.63	3.73	0.50	0.16
Give drugs and fluids	2.88	0.71	3.11	0.68	0.23
Defibrillate	2.69	0.95	2.78	0.69	0.09
Call for help	3.56	0.59	3.78	0.42	0.22
Declare an emergency	3.16	0.68	3.44	0.64	0.28
Verbalise possible diagnosis	2.61	0.55	3.07	0.72	0.46
Allocate tasks to team members	2.72	0.46	3.13	0.64	0.41
Maintain an overview	2.44	0.81	2.87	0.63	0.43
Verbalise your treatment plan	2.63	0.68	3.09	0.87	0.33
Organise the team	2.56	0.53	2.89	0.78	0.33
Take a leadership role in a medical emergency	2.56	0.53	2.89	0.78	0.33
Take the lead role in a cardiorespiratory arrest or trauma case	1.88	0.99	3	0.82	2.12

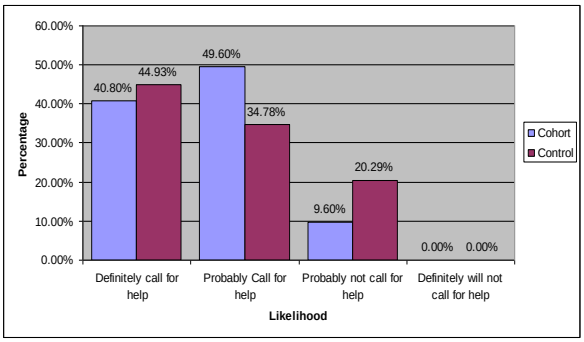
8.5 Baseline likelihood of calling for help

All trainees in the sample were asked how likely they were to call for help in certain circumstances. The results for the cohort were compared against the results from the control group to determine if the baseline likelihood to call for help was the same for both groups.

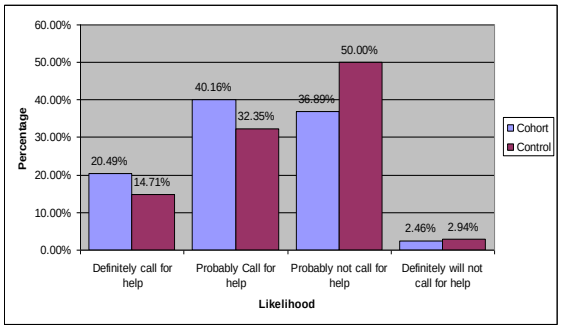
The following figures and table show that trainees in both groups are, overall, already likely to call for help in the emergencies listed, especially in the case of cardiac and respiratory arrest. Apart from in those instances, there is some spread of likelihood.

Figure 16. Overview of baseline likelihood of calling for help

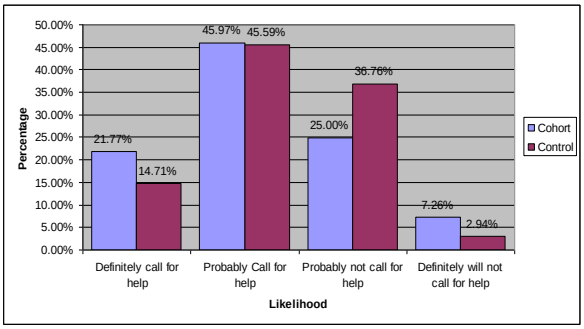
When you cannot get a line in



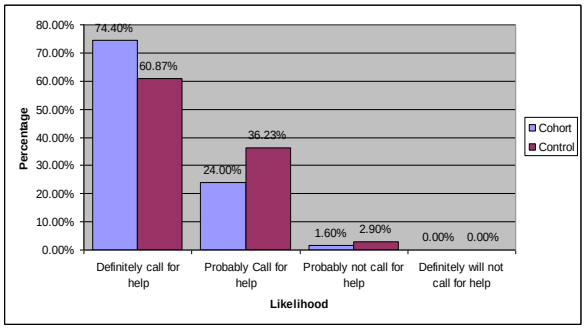
Patient is breathless



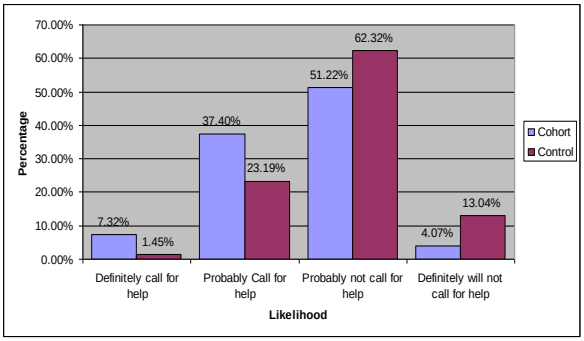
Patient needs 60% oxygen



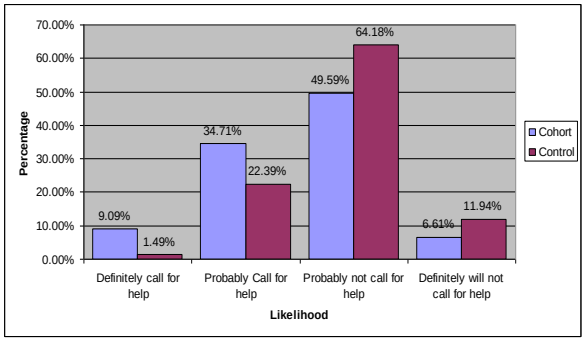
Patient is blue and breathless



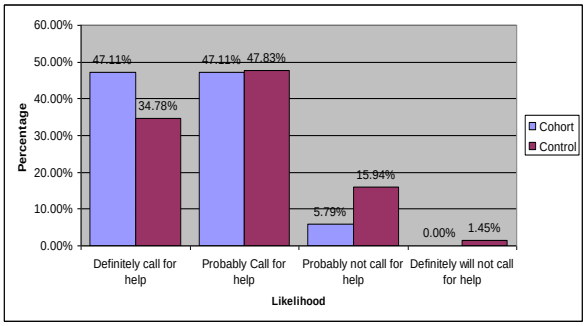
Oxygen saturations are below 94%



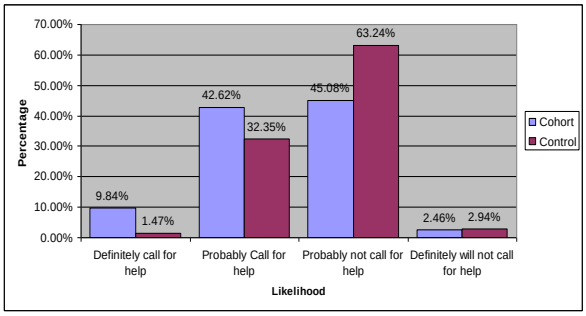
When the patient needs 40% oxygen



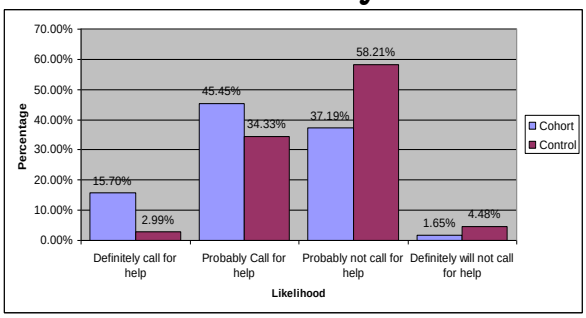
When the patient's respiratory rate is 38 BPM



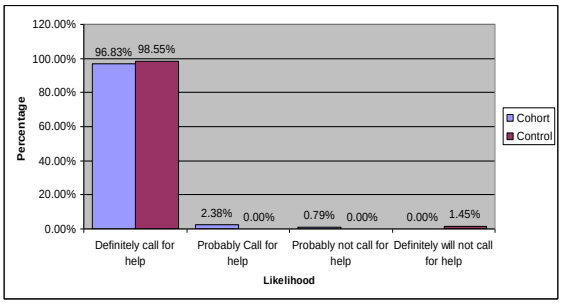
When the patient's heart rate is above 100 BPM



When the patient's blood pressure is below 100 systolic



Respiratory arrest



Cardiac arrest

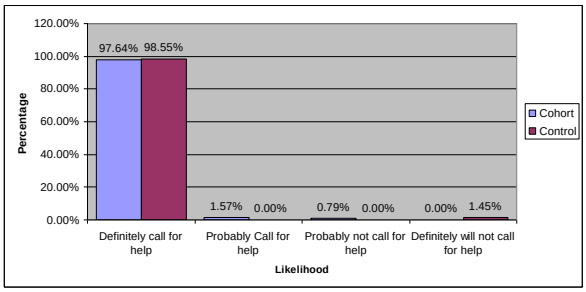


Table 18. Baseline confidence levels of cohort and control groups in calling for help

Task	Cohort		Control		Difference between means [shading = rating in favour of cohort
	Mean	SD	Mean	SD	
When you cannot get a line in	3.31	0.64	3.25	0.77	0.06
Patient is breathless	2.79	0.80	2.59	0.78	0.20
Patient needs 60% oxygen	2.82	0.86	2.72	0.75	0.10
Patient is blue and breathless	3.73	0.48	3.58	0.55	0.15
Oxygen saturations are below 94%	2.48	0.69	2.13	0.64	0.35
When the patient needs 40% oxygen	2.46	0.75	2.13	0.63	0.33
When the patient's respiratory rate is 38 BPM	3.41	0.60	3.16	0.74	0.25
When the patient's heart rate is above 100 BPM	2.60	0.70	2.32	0.56	0.28
When the patients blood pressure is below 100 systolic	2.75	0.73	2.36	0.62	0.39
Respiratory arrest	3.95	0.31	3.96	0.36	+0.01
Cardiac arrest	3.96	0.29	3.96	0.36	No difference

8.6 Factors affecting the decision to call for help

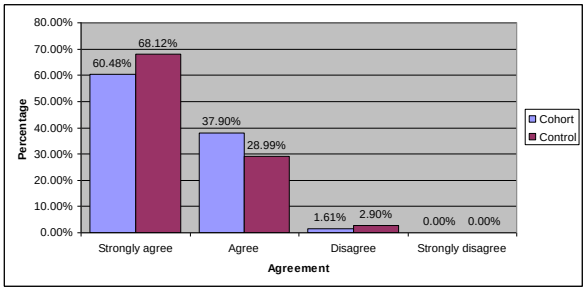
All trainees in the sample were given a series of statements relating to their decisions to call for help and the factors that may affect their decisions. The trainees were asked if they 'strongly agreed', 'agreed', 'disagreed' or 'strongly disagreed' with each statement. Trainees were asked to rate their agreement with each statement.

As above, in order to determine if the cohort and control group were similar, we compared their responses.

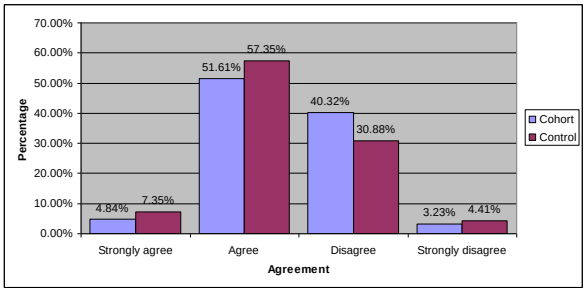
It can be seen from the following figures and table that the cohort and control groups are similar in their positive willingness to call for help in the circumstances listed.

Figure 17. Overview of factors affecting the decision to call for help

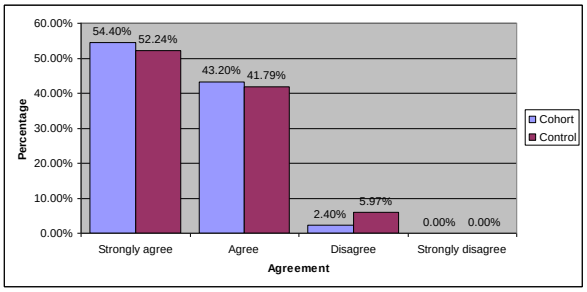
I am happy to call for help whenever I need it



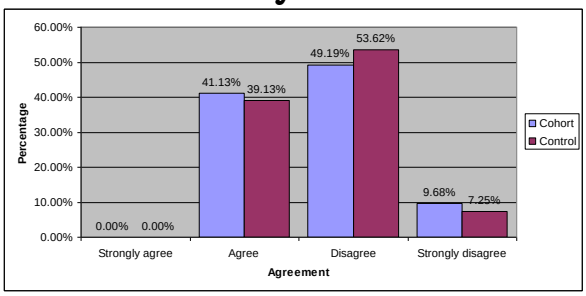
I am less likely to call for help if my immediate senior is busy in clinic/theatre



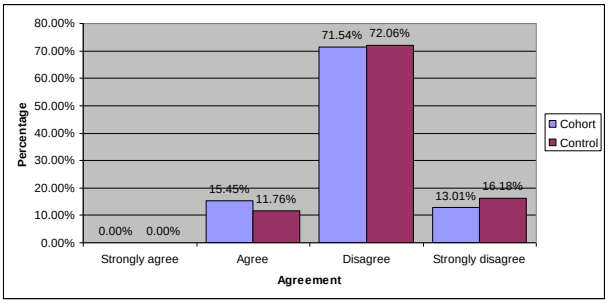
I am happy to call for help at 2pm



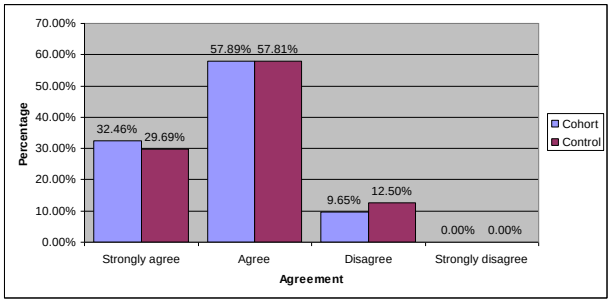
I don't always call for help because I feel that I should be able to cope myself



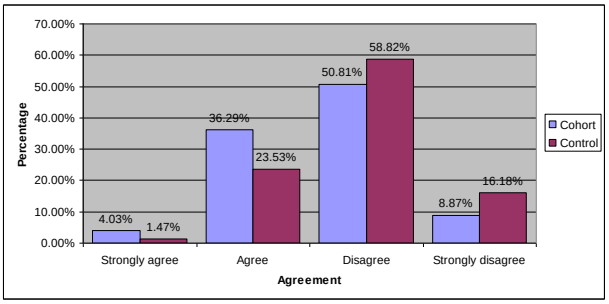
If I don't know the diagnosis I am reluctant to call for help straight away



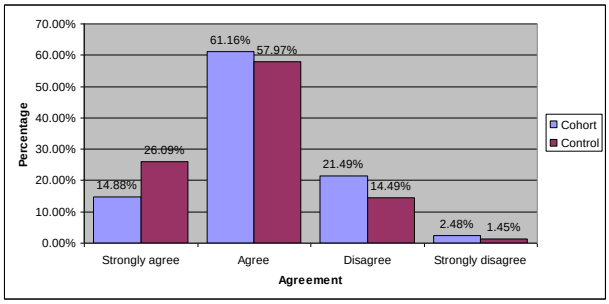
I am happy to call for help at 4am



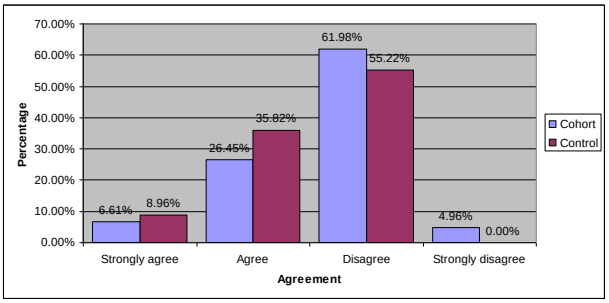
I sometimes don't know whom to call



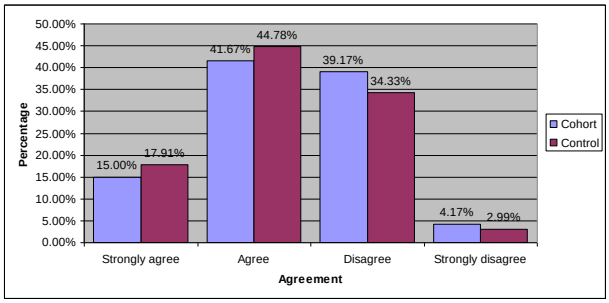
I like to get all the basic investigations done first before I call for help



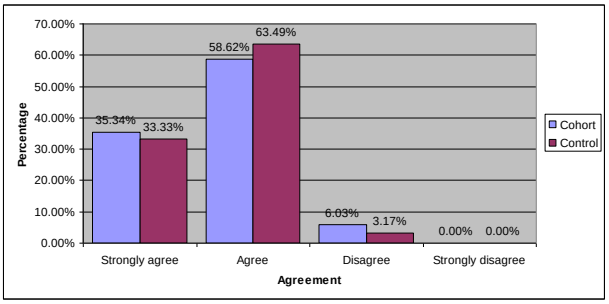
I am less likely to call for hep if my immediate senior is non-resident



I am less likely to call for help if I have been previously criticised by my immediate senior for doing so



I am happy to call for help at 7am



I am not sure what I am expected to cope with before calling for help

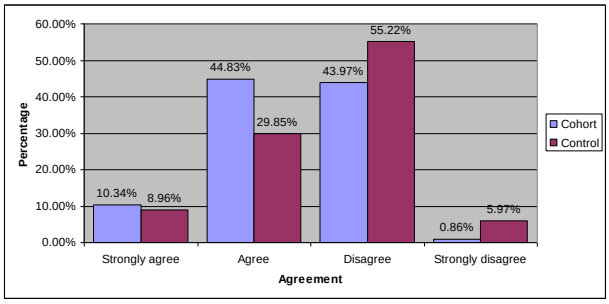


Table 19. Factors in calling for help

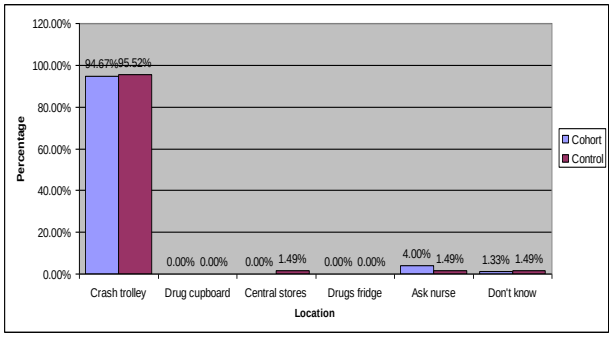
Task	Cohort		Control		Difference between means [shading = rating in favour of cohort
	Mean	SD	Mean	SD	
I am happy to call for help whenever I need it	3.59	0.53	3.65	0.54	0.06
I am less likely to call for help if my immediate senior is busy in clinic/theatre	2.42	0.64	2.32	0.68	0.10
I am happy to call for help at 2pm	3.52	0.55	3.06	0.61	0.46
I don't always call for help because I feel that I should be able to cope myself	2.69	0.64	2.68	0.61	0.01
If I don't know the diagnosis I'm reluctant to call for help straight away	2.98	0.54	3.04	0.53	0.06
I am happy to call for help at 4am	3.23	0.61	3.17	0.63	0.06
I sometimes don't know whom to call	2.65	0.70	2.90	0.67	0.25
I like to get all the basic investigations done first before I call for help	2.12	0.67	1.93	0.68	0.21
I am less likely to call for help if my immediate senior is non-resident	2.65	0.68	2.46	0.66	0.19
I am less likely to call for help if I have been previously criticised by my immediate senior for doing so	2.32	0.78	2.22	0.78	0.10
I am happy to call for help at 7am	3.29	0.58	3.30	0.53	0.01
I'm not sure what I am expected to cope with before calling for help	2.35	0.68	2.58	0.74	0.23

8.7 Knowledge of the environment

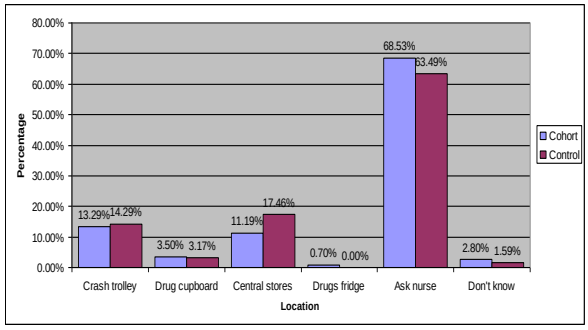
All trainees in the sample were asked to state the location for a list of items that would be located in their workplace. The results were compared for the cohort and control groups to determine if their knowledge of the location of each item is similar. The results for each item are presented below and it can be seen that the patterns of knowledge are similar for both groups.

Figure 18. Overview of knowledge of the environment

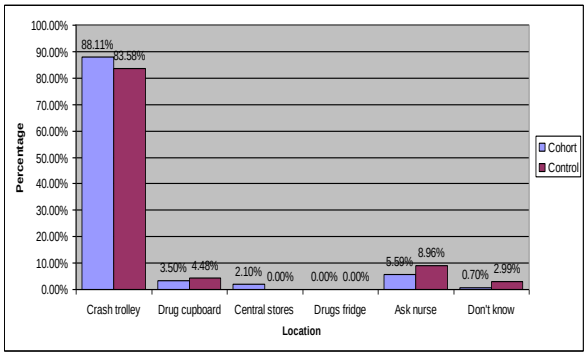
Defibrillator



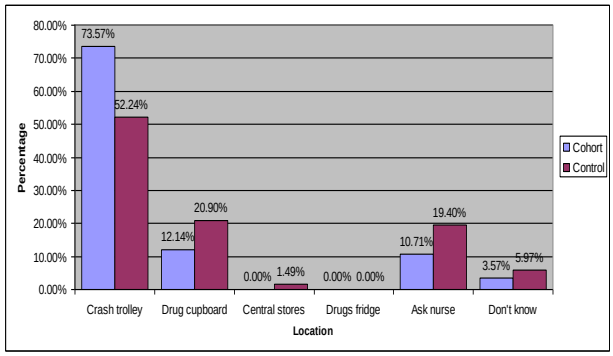
12 lead ECG



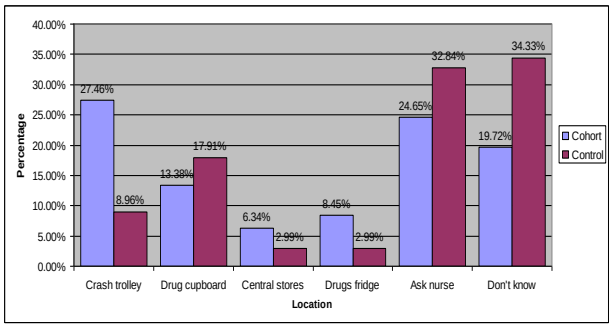
Adrenaline 1mg minijets



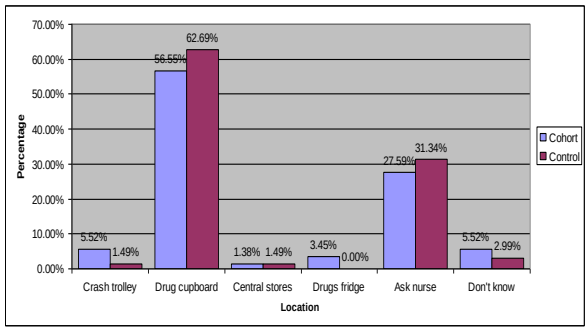
Amiodarone



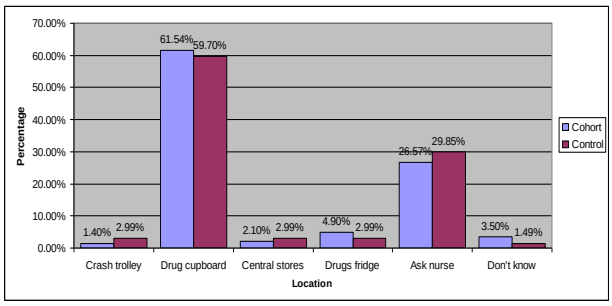
Suxamethonium



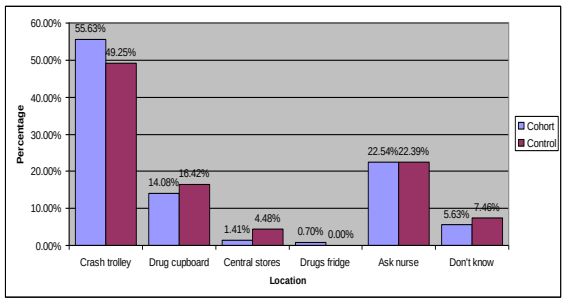
Ventolin nebules



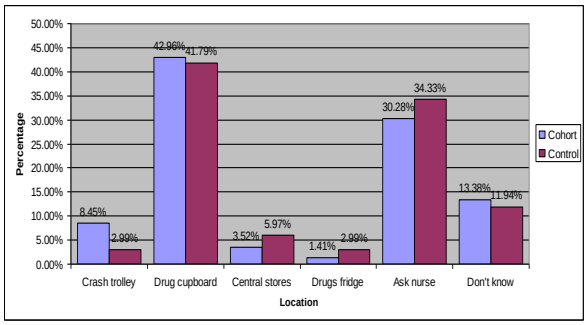
Cefuroxime



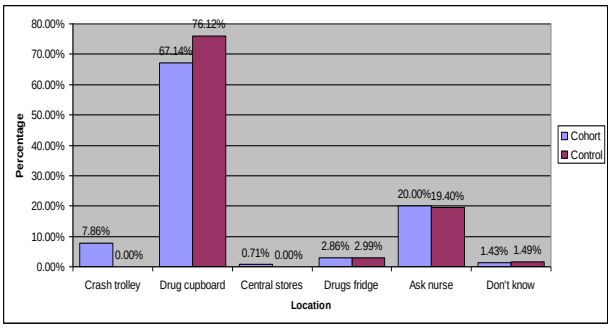
Adenosine



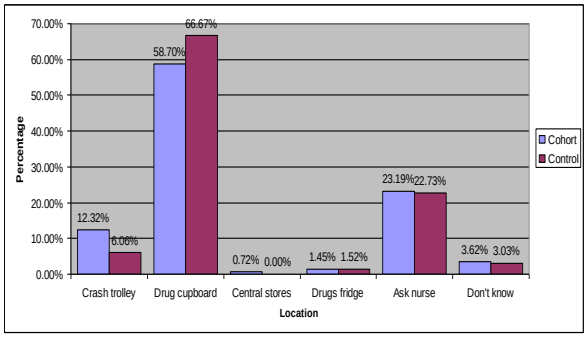
Sotalol



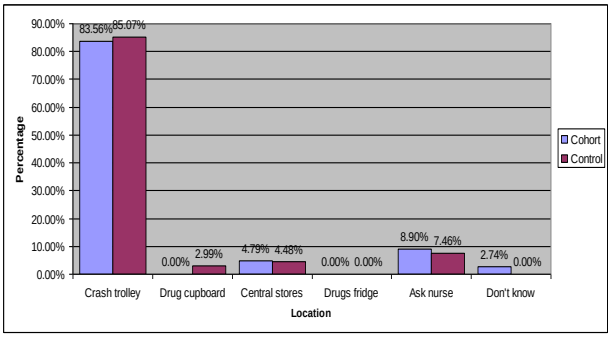
Aspirin



GTN



Endotracheal tubes



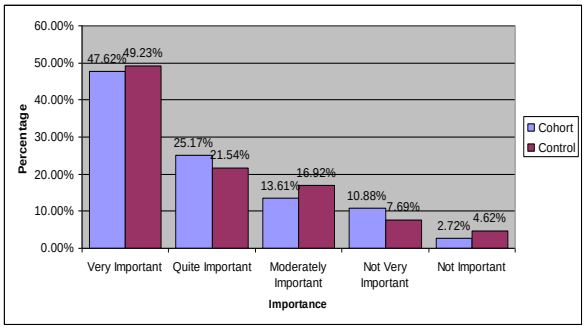
8.8 Knowing the team

All trainees in the sample were asked the importance of knowing the names of other healthcare professionals they work with in an emergency. Trainees were asked to rate the importance as 'very important', 'quite important', 'moderately important', 'not very important', or 'not important'.

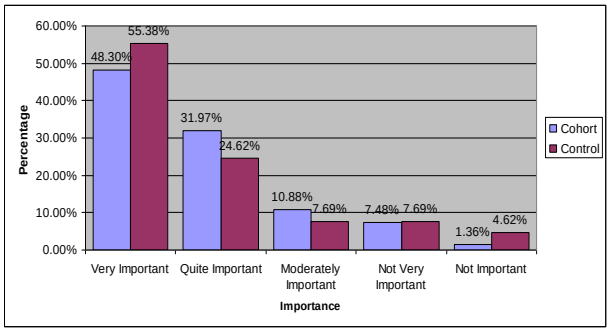
The results were compared for the cohort and control group and are presented below. There are no systematic differences that would jeopardise the comparison of the groups 4 months after the baseline study.

Figure 19. Overview of knowing the team

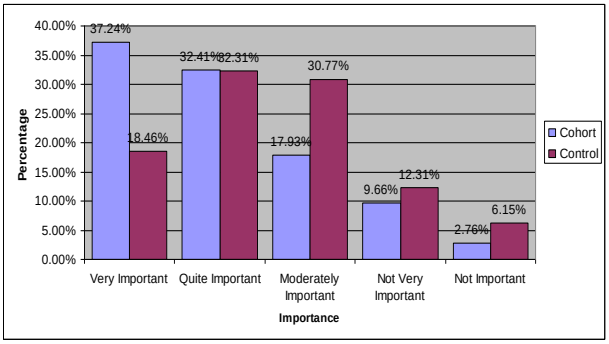
Consultant



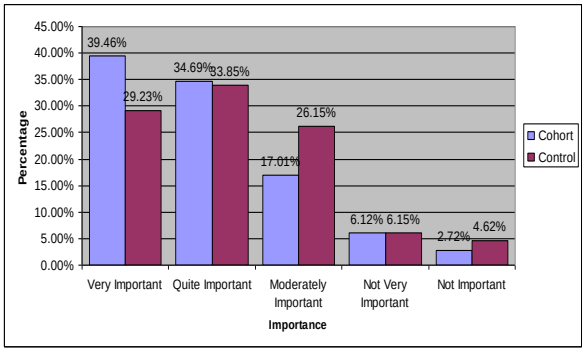
SpR leading the emergency



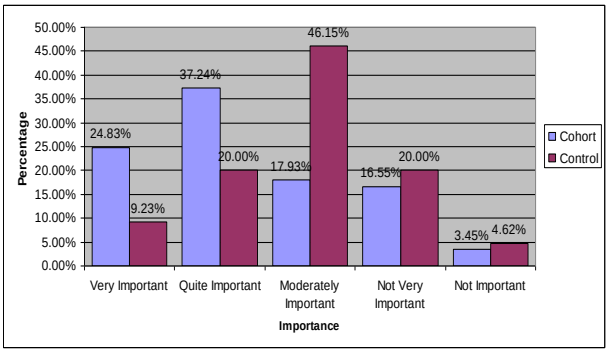
Anaesthetic SpR



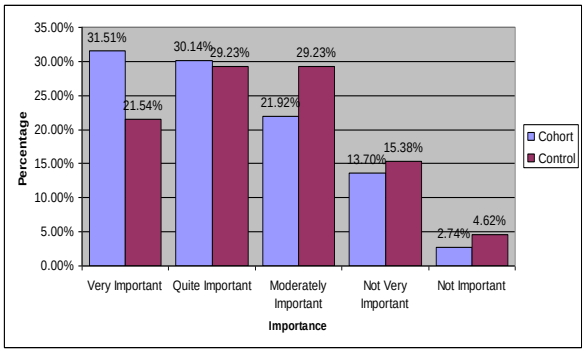
Ward sister



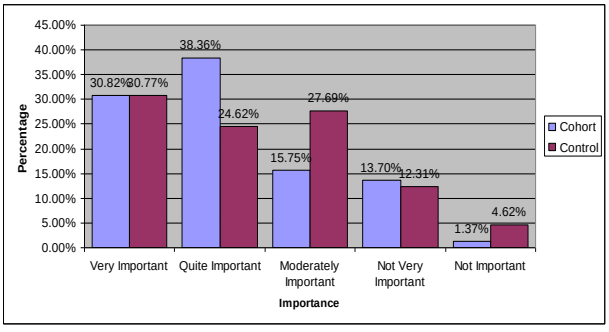
ICU nurses



Resuscitation officer



Staff nurses on ward



Porters on ward

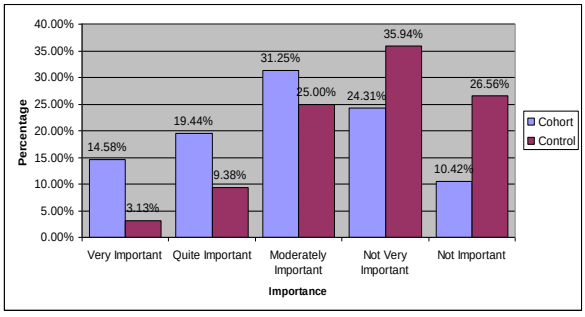


Table 20. Knowing the team

Team member	Cohort		Control		Difference between means [shading = rating in favour of cohort
	Mean	SD	Mean	SD	
Consultant	4.04	1.14	4.03	1.19	0.01
SpR leading the emergency	4.18	0.99	4.18	1.16	No difference
Anaesthetic SpR	3.92	1.09	3.45	1.12	0.47
Ward sister	4.02	1.03	3.77	1.09	0.06
ICU nurses	3.63	1.13	3.09	0.98	0.52
Resuscitation officer	3.74	1.13	3.48	1.13	0.19
Staff nurses on ward	3.84	1.06	3.65	1.18	0.19
Porters on ward	3.03	1.2	2.27	1.06	0.66

Having established the slight advantage of the control group over the cohort in terms of experience but no other systematic differences, we can go on to ascertain whether the simulation training had benefits over and above that of experience in the four months following the baseline measures.

PART FOUR:

COMPARISON OF GROUPS FOUR MONTHS AFTER THE BASELINE MEASURES

9 WAS THE COHORT BETTER THAN THE CONTROL GROUP AFTER 4 MONTHS?

Comparison of baseline data showed that there were no systematic differences that would jeopardise the comparison of the groups 4 months after the baseline study.

Therefore to determine the lasting effects of the training day, we compared the cohort and the control after 4 months. We compared the data for both groups from the 'Real Incident Self-Assessment' questionnaire. The number of trainees completing this questionnaire is shown in the table below.

Table 21. Sample for size for real incident data

Sample	n.
Cohort	78
Control	34

9.1 Experience of emergencies

All trainees were asked if they had been directly involved in the management of any identified emergencies since completing the original questionnaire. Those who had been involved were asked to indicate the level of confidence they felt in their performance.

The table below indicates the number and percentage of trainees who had experienced each type of emergency. Overall, members of the cohort group had each experienced marginally fewer emergencies than members of the control group. This difference is unlikely to bias results.

Table 22. Emergencies experienced in practice

Type of Emergency	Cohort (%)	Control (%)	Total (%)
Respiratory	61 (78.2)	30 (88.2)	91 (81.2)
Cardiovascular	66 (84.6)	33 (97.0)	99 (88.3)
Gastrointestinal	63 (80.8)	28 (82.3)	91 (81.2)
Genitourinary	67 (85.6)	30 (88.2)	97 (86.6)
Neurological	48 (61.5)	27 (79.4)	75 (66.9)
Metabolic	46 (58.9)	28 (82.3)	74 (66.0)
Infectious	63 (80.7)	31 (91.1)	94 (83.9)
Multiple Trauma	38 (48.7)	21 (61.7)	59 (52.6)
Other	21 (26.9)	10 (29.4)	31 (27.6)

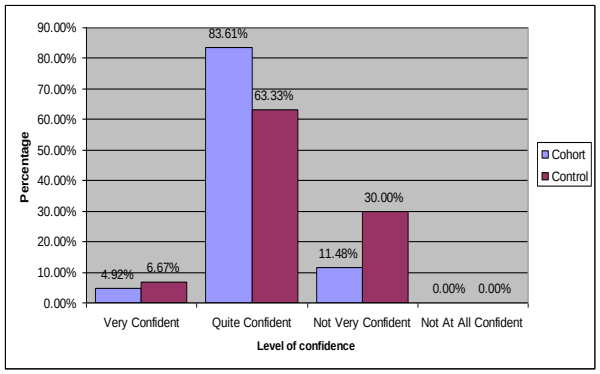
9.2 Confidence in handling emergencies

The figures and tables below show that, overall, the trained group feel more generally confident than the control group [mean score of 2.73 vs. 2.38]. however, when asked about their confidence in relation to actual emergencies experienced, a slightly difference picture emerges.

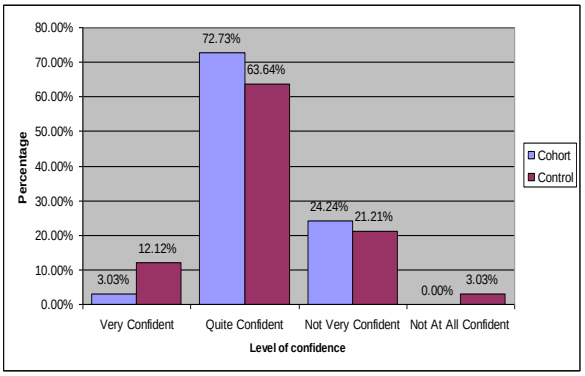
Although the observed differences in confidence ratings is small, the cohort feel more confident than the control group in only 2 out of the 8 types of emergency experienced. In practical terms, there is probably no real difference.

Figure 20. Overview of comparative confidence of cohort and control groups in handling emergencies

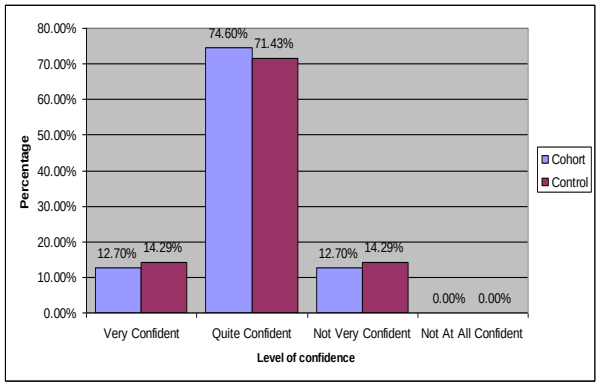
Confidence in dealing with a respiratory emergency



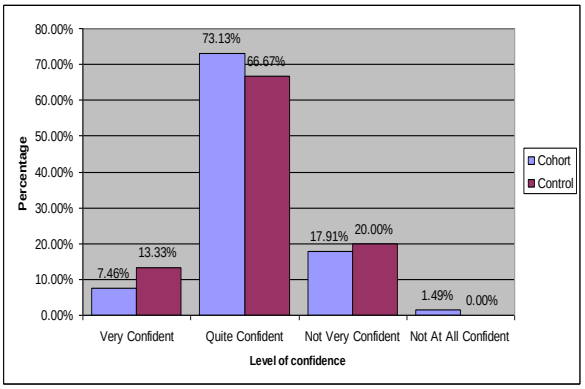
Confidence in dealing with a cardiovascular emergency



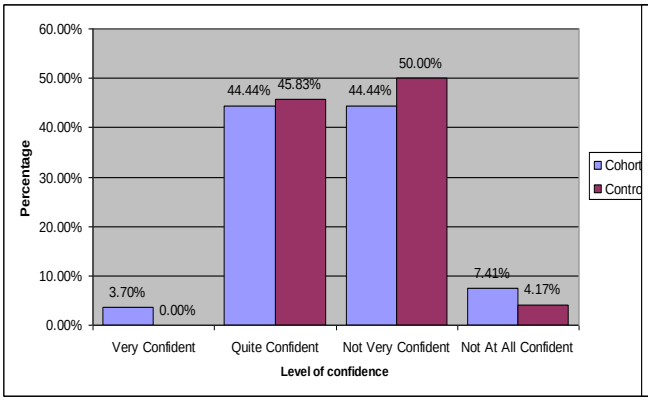
Confidence in dealing with a gastrointestinal emergency



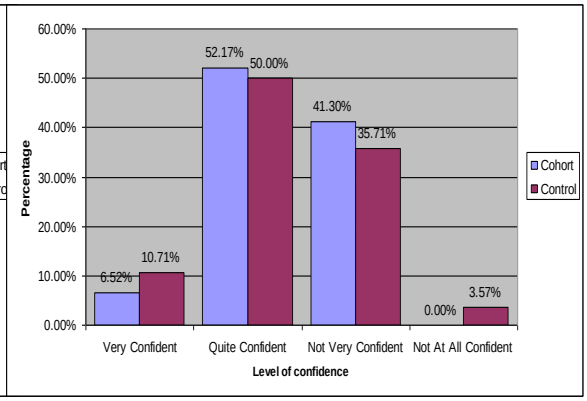
Confidence in dealing with a genitourinary emergency



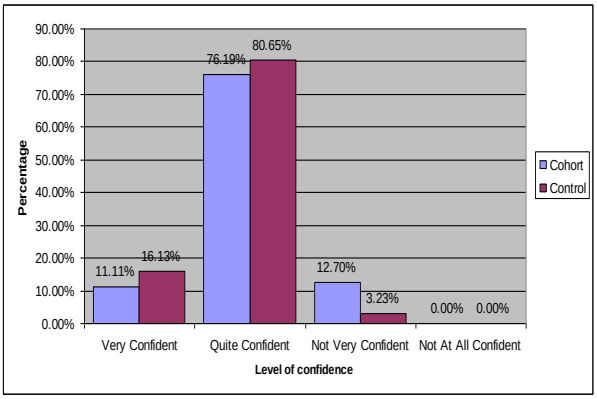
Confidence in dealing with a neurological emergency



Confidence in dealing with a metabolic emergency



Confidence in dealing with an infectious emergency



Confidence in dealing with a multiple trauma

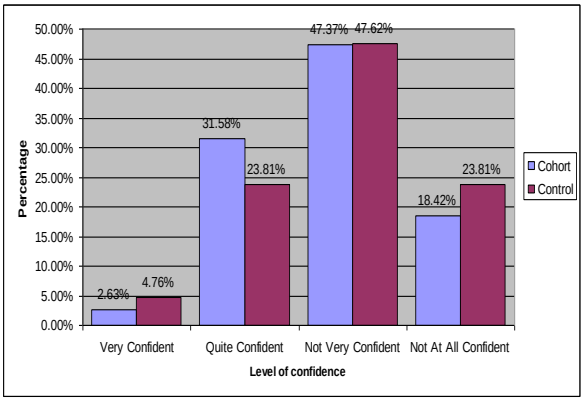


Table 23. Confidence in dealing with emergencies

Emergency	Cohort		Control		Difference between group means [shading implies difference in favour of cohort]
	Mean	SD	Mean	SD	
Respiratory	2.93	.403	2.77	.568	0.16
Cardiovascular	2.79	.481	2.85	.667	0.06
Gastrointestinal	3.00	.508	3.00	.544	0
Genitourinary	2.87	.548	2.93	.583	0.06
Neurological	2.42	.577	2.44	.698	0.02
Metabolic	2.65	.604	2.68	.723	0.03
Infectious	2.98	.492	3.13	.428	0.15
Multiple trauma	2.18	.766	2.10	.831	0.08
Overall confidence	2.73	.547	2.38	.630	0.35

9.3 Experience of tasks

All trainees were asked to identify tasks that they had undertaken since either the simulation training course (cohort) or since completing the baseline questionnaire (control). Trainees were also asked to indicate how confident they felt in their performance.

The table below indicates the number and percentage of trainees who had undertaken the identified tasks. In general, the controls had undertaken more tasks than the cohort.

Table 24. Tasks undertaken in practice

Task	Cohort frequency (%)	Control frequency (%)
ABC assessment	51 (65.3)	30 (88.2)
Apply monitoring	37 (47.4)	21 (61.7)
Give oxygen	56 (71.7)	27 (79.4)
Always wash my hands	46 (58.9)	22 (64.7)
Insert a cannula	56 (71.9)	30 (88.2)
Take bloods	60 (76.9)	30 (88.2)
Always wear gloves	57 (73.0)	27 (79.4)
Give drugs and fluids	46 (58.9)	24 (70.5)
Defibrillate	16 (20.5)	7 (20.5)
Call for help	51 (65.3)	27 (79.4)
Declare an emergency	32 (41.0)	20 (58.8)
Verbalise possible diagnosis	37 (47.4)	24 (70.5)
Allocate tasks to team members	24 (30.7)	13 (38.2)
Maintain an overview	19 (24.3)	10 (29.4)
Verbalise your treatment plan	27 (34.6)	18 (52.9)
Organise the team	15 (19.2)	10 (29.4)
Take a leadership role in a medical emergency	19 (24.3)	7 (20.5)
Take the lead role in a cardiorespiratory arrest or trauma case	9 (11.5)	7 (20.5)

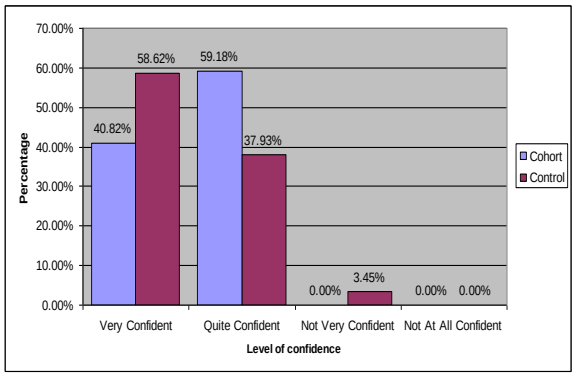
9.4 Confidence in performing tasks

The following figures and tables show that in all but two tasks [calling for help and maintaining on overview], the control group feel more confident than the control group. The reason for this is not clear – it might be that training has enabled the junior doctor to appreciate dangers that are otherwise not seen or to compare themselves with a standard of practice

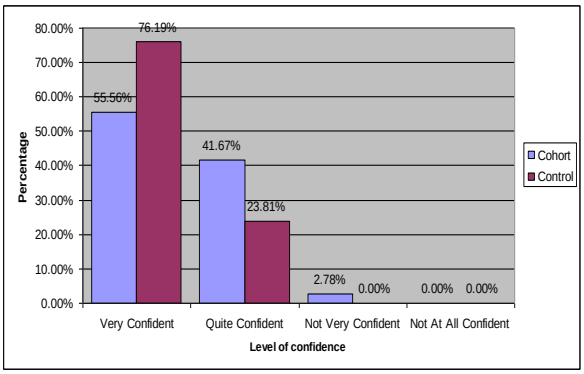
that the control group do not have. In this study, we do not know the extent to which confidence correlates with performance.

Figure 21. Overview of comparative confidence of cohort and control groups in performing tasks

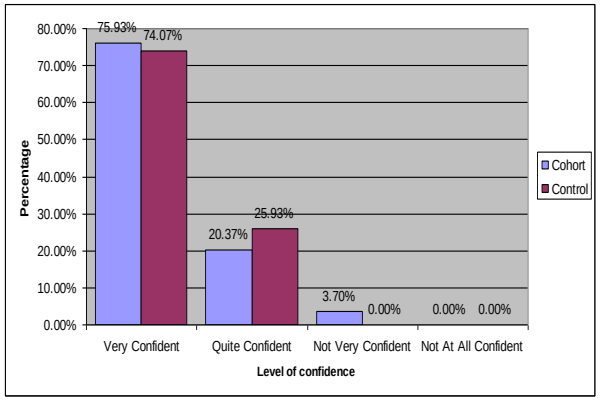
Confidence in performing an ABC assessment



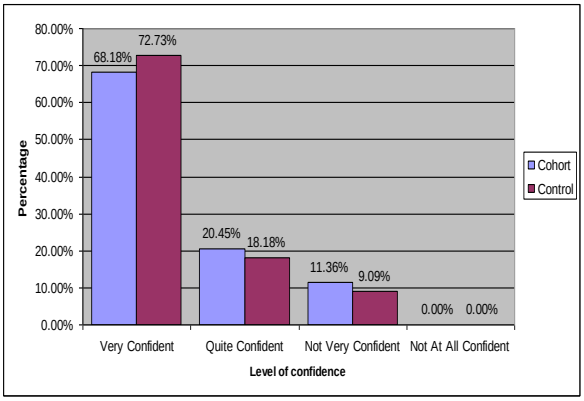
Confidence in applying monitoring



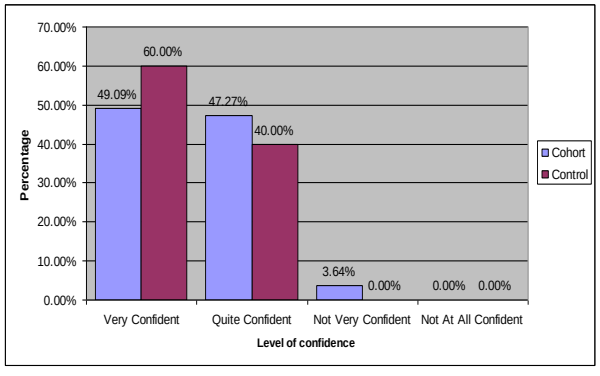
Confidence in giving oxygen



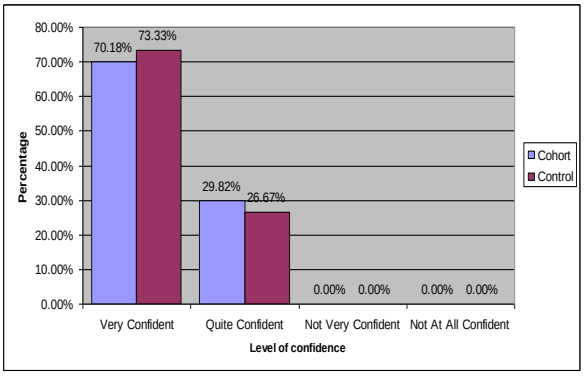
Confidence in always washing hands



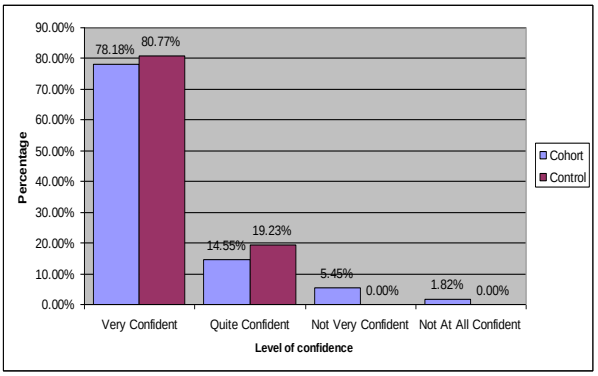
Confidence in inserting a cannula



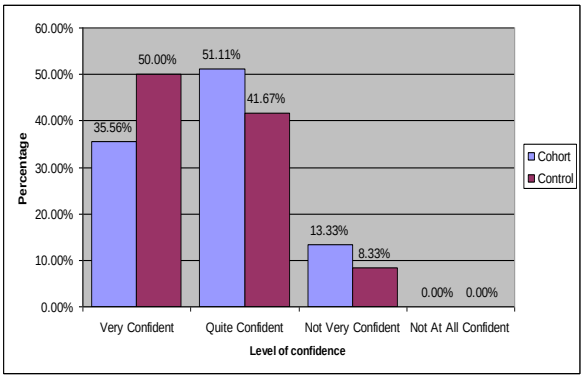
Confidence in taking bloods



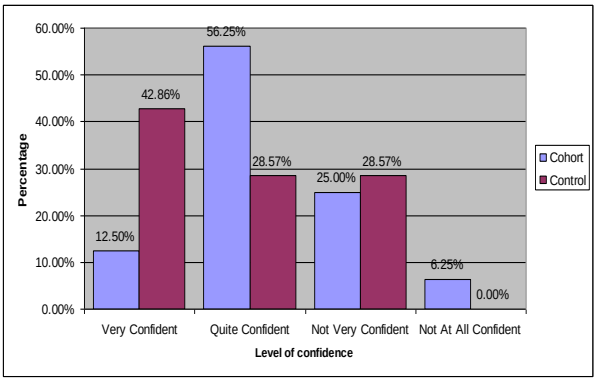
Confidence in always wearing gloves



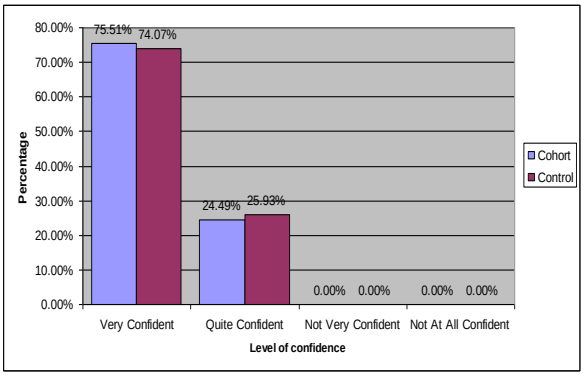
Confidence in giving drugs and fluids



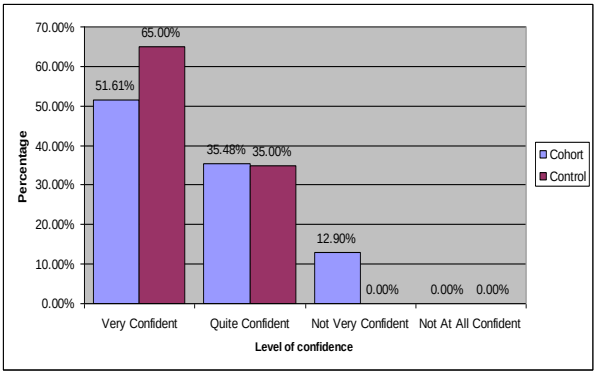
Confidence in defibrillating



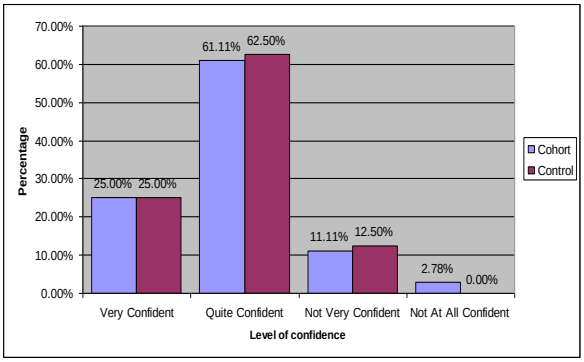
Confidence in calling for help



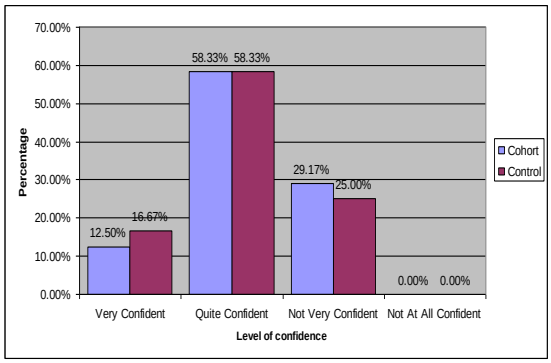
Confidence in declaring an emergency



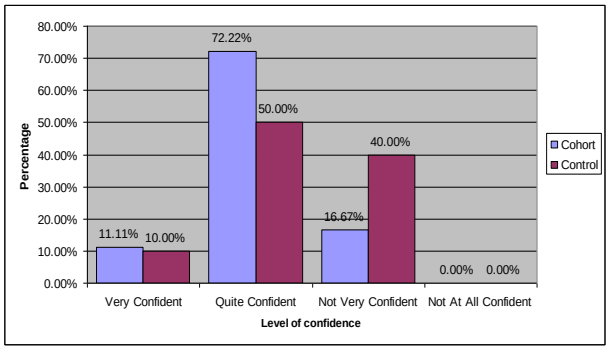
Confidence in verbalising possible diagnosis



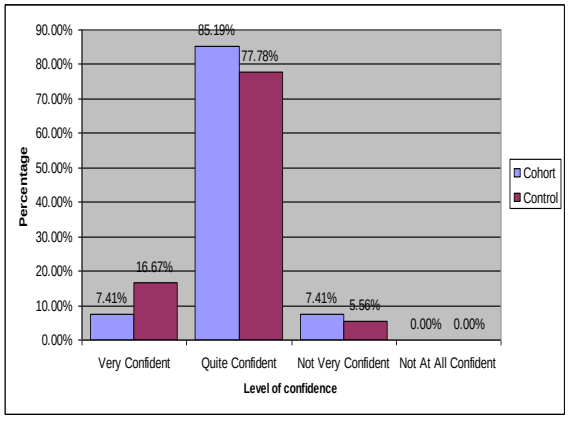
Confidence in allocating tasks to team members



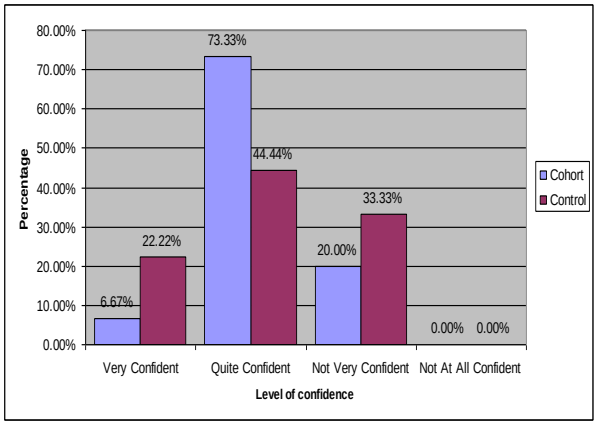
Confidence in maintaining an overview



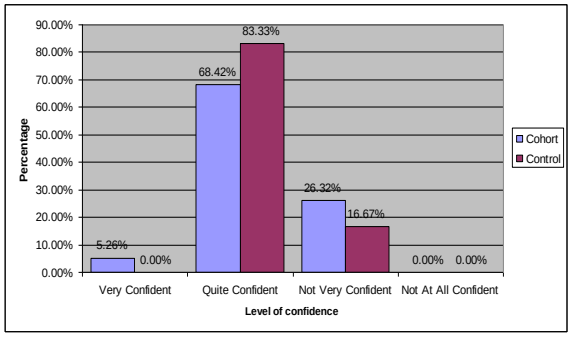
Confidence in verbalising a treatment plan



Confidence in organising the team



Confidence in taking the lead role in a medical emergency



Confidence in taking the lead role in a cardiorespiratory arrest or trauma

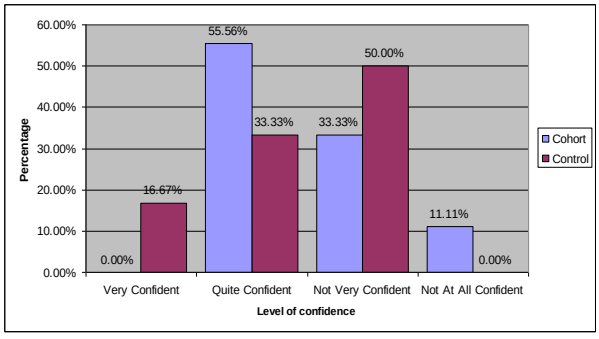


Table 25. Confidence in dealing with tasks

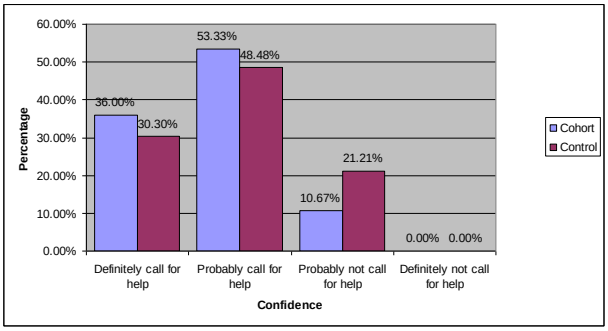
Task	Cohort		Control		Difference between group means [shading implies difference in favour of cohort]
	Mean	SD	Mean	SD	
ABC assessment	3.41	0.497	3.55	0.572	0.14
Apply monitoring	3.53	.560	3.76	.436	0.23
Give oxygen	3.72	0.529	3.74	0.447	0.02
Always wash my hands	3.57	0.695	3.64	0.658	0.07
Insert a cannula	3.45	.571	3.60	.498	0.15
Take bloods	3.70	0.462	3.73	0.450	0.03
Always wear gloves	3.69	0.663	3.81	0.402	0.12
Give drugs and fluids	3.22	0.670	3.42	0.654	0.20
Defibrillate	2.75	0.775	3.14	0.900	0.39
Call for help	3.76	0.434	3.74	0.447	0.02
Declare an emergency	3.39	0.715	3.65	0.489	0.26
Verbalise possible diagnosis	3.08	0.692	3.13	0.612	0.05
Allocate tasks to team members	2.83	0.637	2.92	0.669	0.09
Maintain an overview	2.94	0.539	2.70	0.675	0.24
Verbalise your treatment plan	3.00	0.392	3.11	0.471	0.11
Organise the team	2.87	0.516	2.89	0.782	0.02
Take a leadership role in a medical emergency	2.79	0.535	2.83	0.408	0.04
Take the lead role in a cardiorespiratory arrest or trauma case	2.44	0.726	2.67	0.816	0.23

9.5 Calling for help

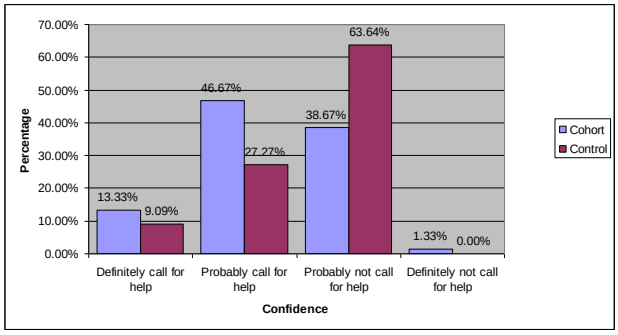
The cohort and control group were compared 4 months after the baseline measures in their confidence to call for help. The Figure 22 and Table 26 show that overall the cohort group are marginally more likely to call for help in six the 11 emergencies listed although standards deviations are relatively large in these cases. There is general willingness in both groups to call for help in the cases of cardiac or respiratory arrest.

Figure 22. Overview of comparative willingness of cohort and control groups to call for help

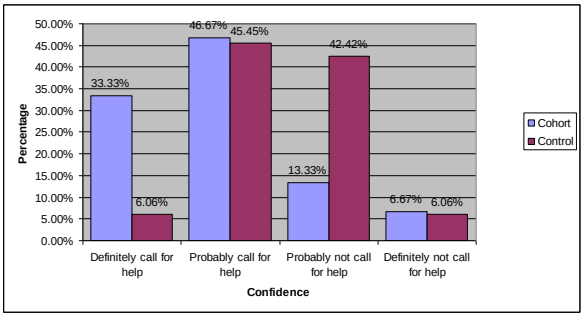
When you cannot get a line in



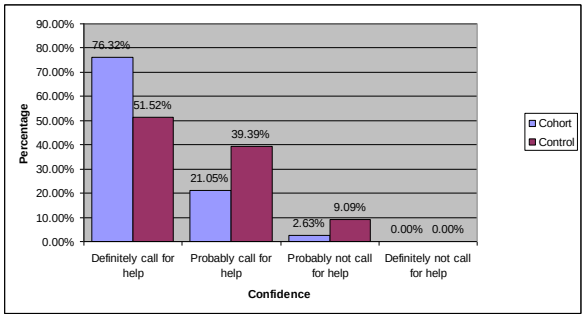
Patient is breathless



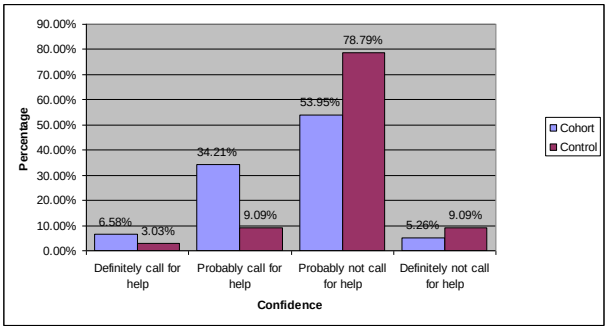
Patient needs 60% oxygen



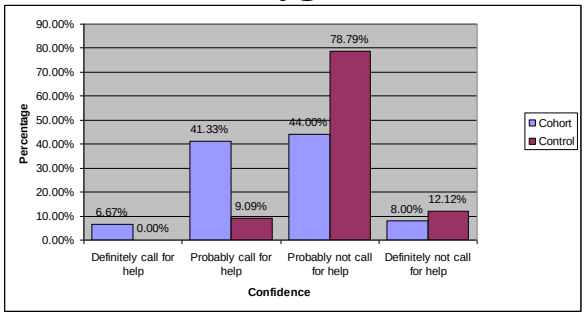
Patient is blue and breathless



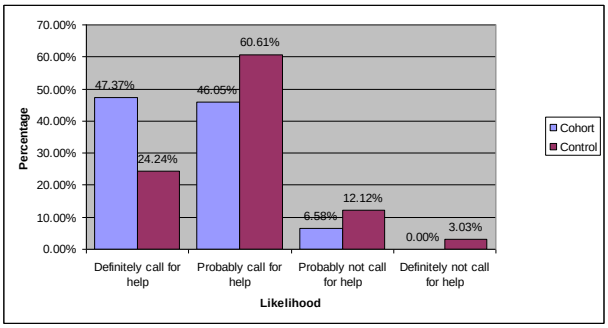
Oxygen saturations are below 94%



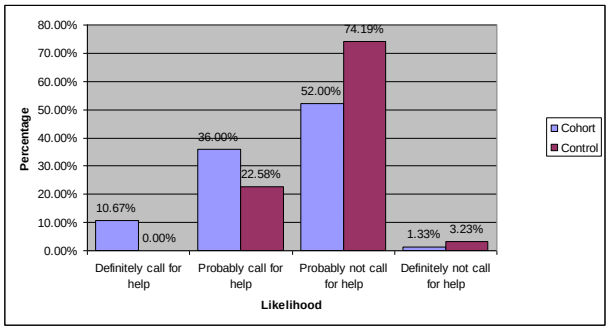
When the patient needs 40% oxygen



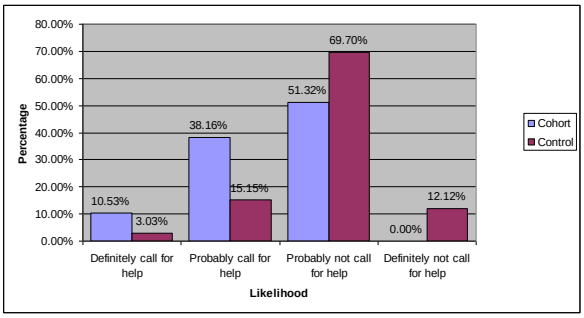
When the patient's respiratory rate is 38 BPM



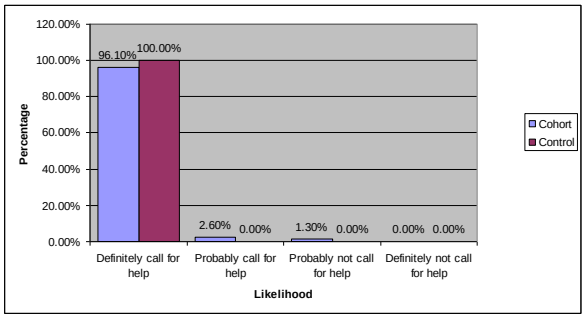
When the patient's heart rate is above 100 BPM



When the patient's blood pressure is below 100 systolic



Respiratory arrest



Cardiac arrest

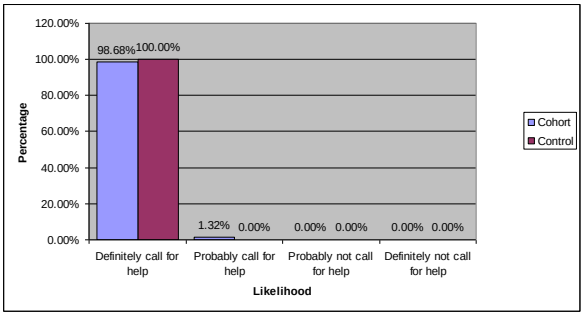


Table 26. Willingness to call for help

Occasion	Cohort		Control		Difference between group means [shading implies difference in favour of cohort]
	Mean	SD	Mean	SD	
When you cannot get a line in	3.25	0.64	3.09	0.72	0.14
Patient is breathless	2.72	0.71	2.45	0.67	0.27
Patient needs 60% oxygen	3.07	0.86	2.52	0.71	0.55
Patient is blue and breathless	3.74	0.50	3.42	0.66	0.32
Oxygen saturations are below 94%	2.42	0.70	2.06	0.56	0.36
When the patient needs 40% oxygen	2.47	0.74	1.97	0.47	0.50
When the patient's respiratory rate is 38 BPM	3.41	0.62	3.06	0.70	0.35
When the patient's heart rate is above 100 BPM	2.54	0.72	2.19	0.48	0.25
When the patients blood pressure is below 100 systolic	2.59	0.68	2.09	0.63	0.50
Respiratory arrest	3.95	0.28	4.00	0.000	0.05
Cardiac arrest	3.99	0.12	4.00	0.000	0.01

9.6 Factors affecting the decision to call for help

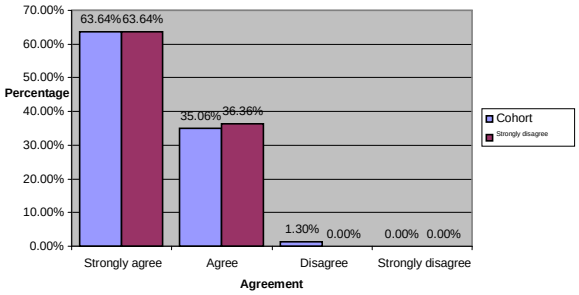
All trainees in the sample were given a series of statements relating to their decisions to call for help and the factors that may affect their decisions. The trainees were asked if they 'strongly agreed', 'agreed', 'disagreed' or 'strongly disagreed' with each statement. Trainees were asked to rate their agreement with each statement.

As above, in order to determine if the cohort and control group were different after 4 months, we compared their responses.

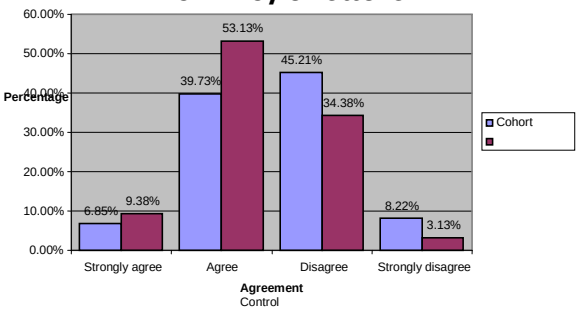
It can be seen from the following figure and table that there are no systematic differences between the cohort and control groups in their positive willingness to call for help in the circumstances listed.

Figure 23. Overview of factors affecting the decision to call for help

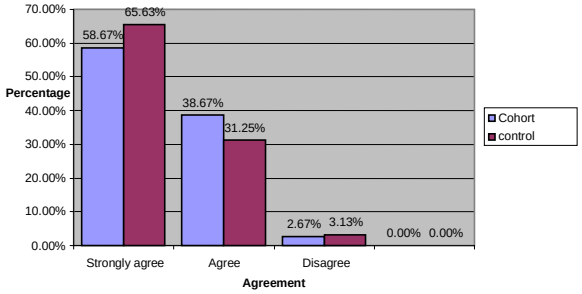
I am happy to call for help whenever I need it



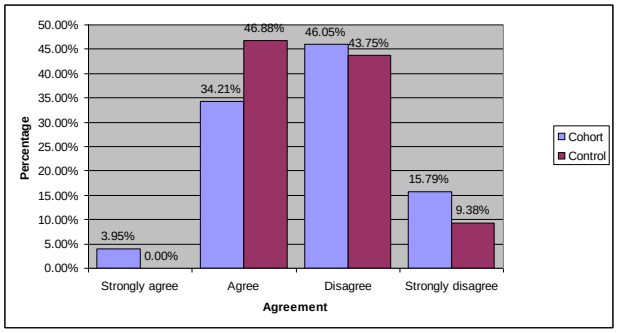
I am less likely to call for help if my immediate senior is busy in clinic/theatre



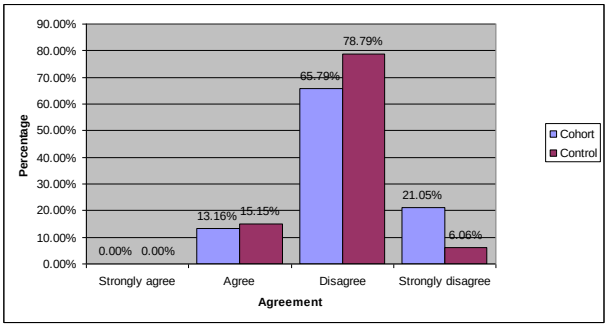
I am happy to call for help at 2pm



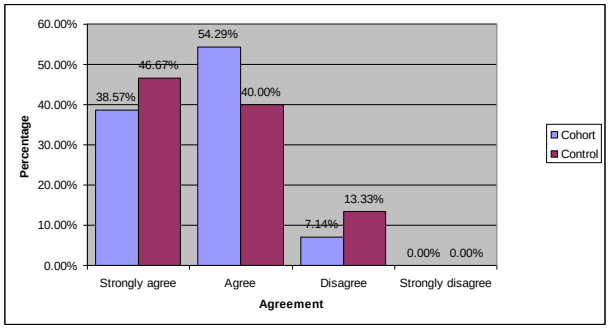
I don't always call for help because I feel that I should be able to cope myself



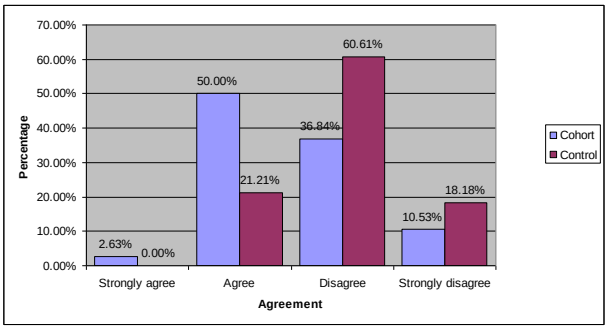
If I don't know the diagnosis I am reluctant to call for help straight away



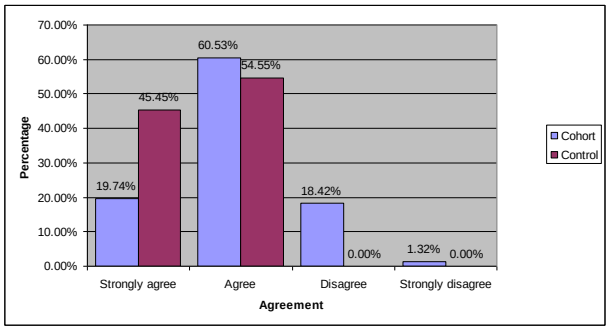
I am happy to call for help at 4am



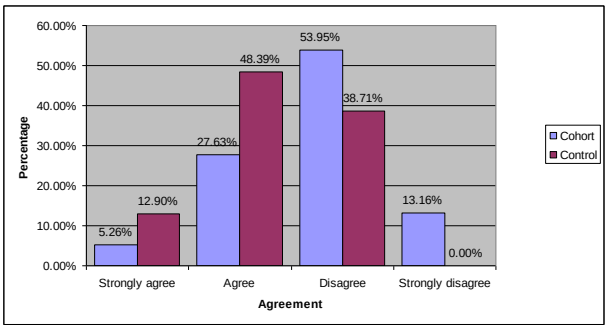
I sometimes don't know whom to call



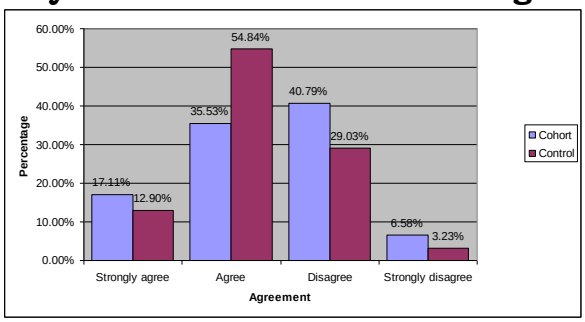
I like to get all the basic investigations done first before I call for help



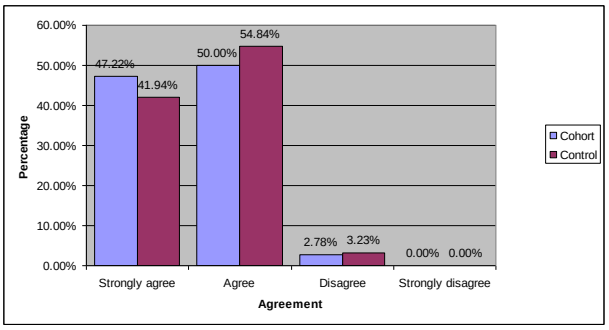
I am less likely to call for hep if my immediate senior is non-resident



I am less likely to call for help if I have been previously criticised by my immediate senior for doing so



I am happy to call for help at 7am



I am not sure what I am expected to cope with before calling for help

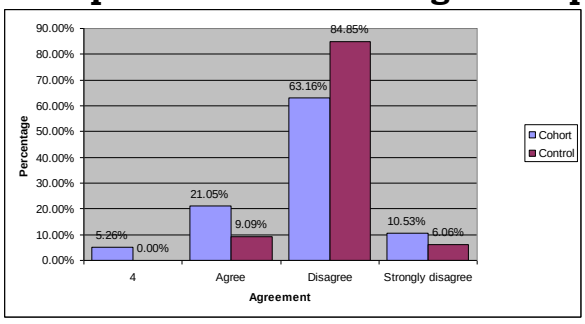


Table 27. Comparative factors in calling for help

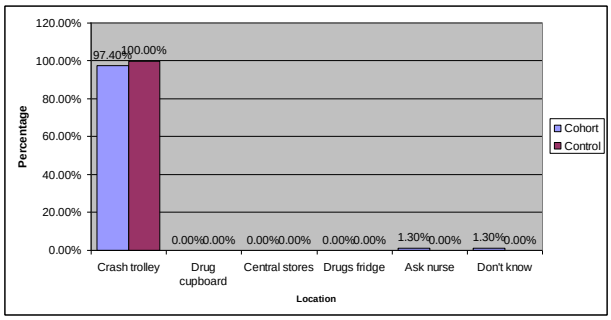
Task	Cohort		Control		Difference between means [shading = score higher for cohort
	Mean	SD	Mean	SD	
I am happy to call for help whenever I need it	3.62	0.51	3.64	0.49	0.02
I am less likely to call for help if my immediate senior is busy in clinic/theatre	2.45	0.75	2.69	0.69	0.24
I am happy to call for help at 2pm	3.56	0.55	3.62	0.55	0.06
I don't always call for help because I feel that I should be able to cope myself	2.26	0.77	2.38	0.66	0.12
If I don't know the diagnosis I'm reluctant to call for help straight away	1.92	0.58	2.09	0.46	0.17
I am happy to call for help at 4am	3.31	0.60	3.33	0.71	0.02
I sometimes don't know whom to call	2.32	0.70	2.03	0.63	0.29
I like to get all the basic investigations done first before I call for help	2.99	0.66	3.30	0.50	0.31
I am less likely to call for help if my immediate senior is non-resident	2.25	0.75	2.74	0.68	0.49
I am less likely to call for help if I have been previously criticised by my immediate senior for doing so	2.63	0.85	2.77	0.72	0.14
I am happy to call for help at 7am	3.44	0.55	3.39	0.56	0.09
I'm not sure what I am expected to cope with before calling for help	2.21	.070	2.03	0.39	0.18

9.7 Comparative knowledge of the environment

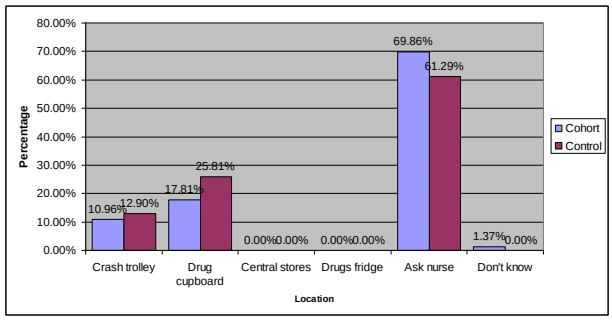
All trainees in the sample were asked to state the location for a list of items that would be located in their workplace. The results were compared for the cohort and control groups after 4 months to determine if their knowledge of the location of each item is similar. The results for each item are presented below and it can be seen that the patterns of knowledge are broadly similar for both groups.

Figure 24. Overview of knowledge of the environment

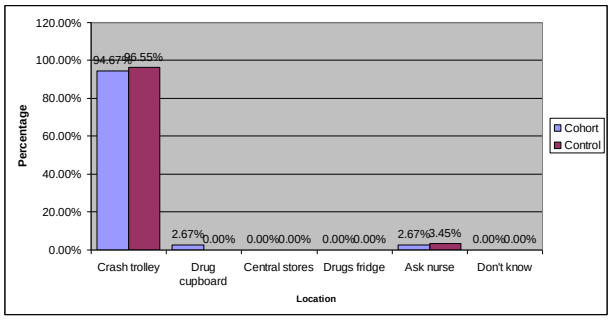
Defibrillator



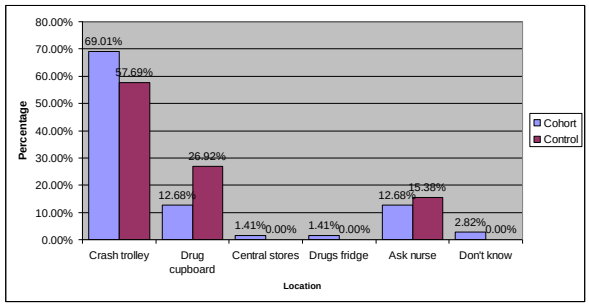
12 lead ECG



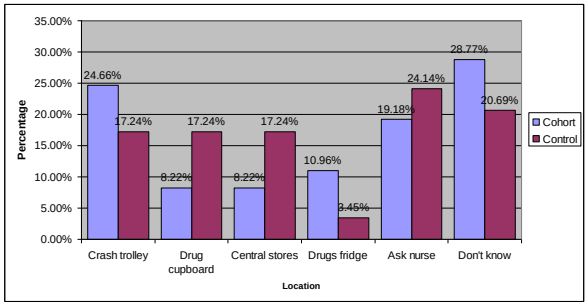
Adrenaline 1mg minijets



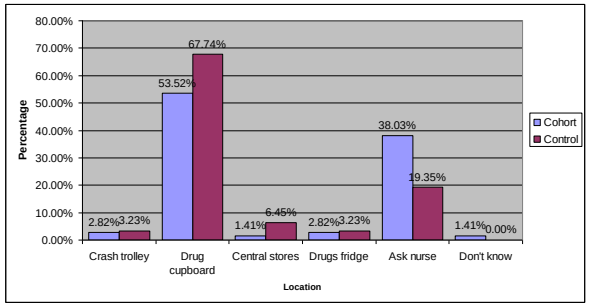
Amiodarone



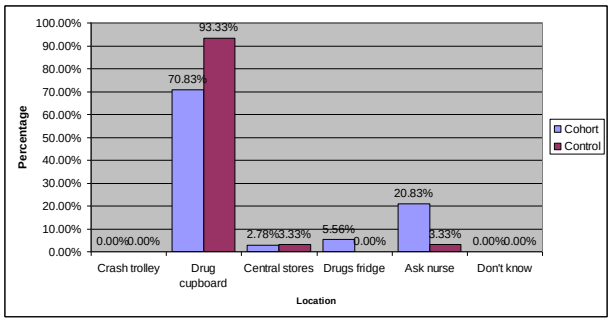
Suxamethonium



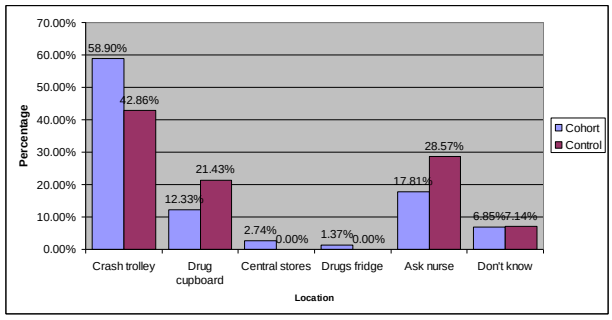
Ventolin nebules



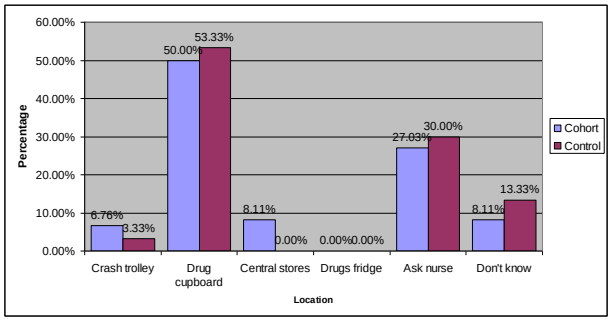
Cefuroxime



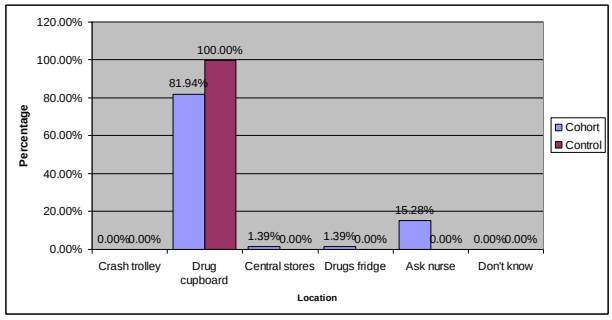
Adenosine



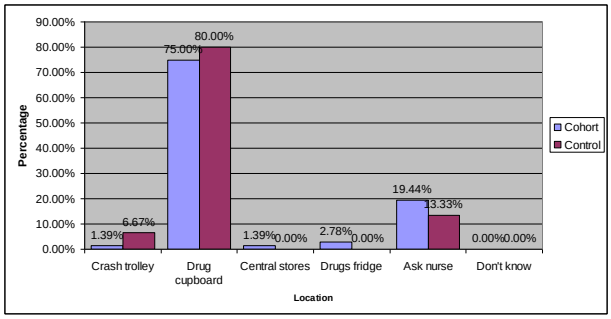
Sotalol



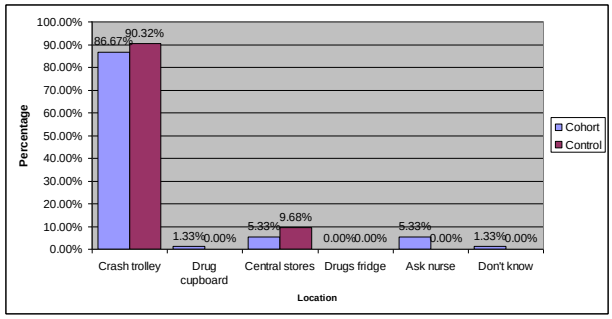
Aspirin



GTN



Endotracheal tubes



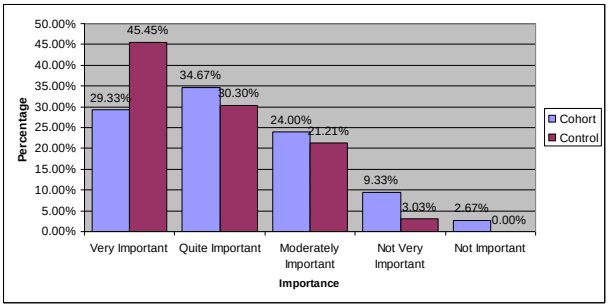
9.8 Comparative views of the team

All trainees in the sample were asked the importance of knowing the names of other healthcare professionals they work with in an emergency. Trainees were asked to rate the importance as 'very important', 'quite important', 'moderately important', 'not very important', or 'not important'.

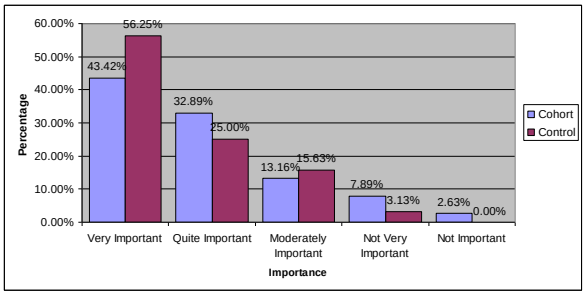
The results were compared after 4 months for the cohort and control group and are presented below. There are systematic differences between the groups with the cohort group recognising the importance of the team [with the exception of porters] more than the control group do.

Figure 25. Overview of knowing the team

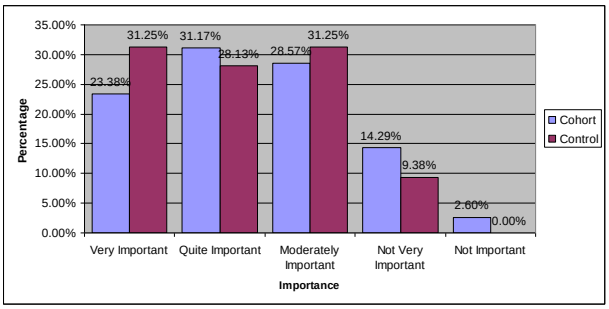
Consultant



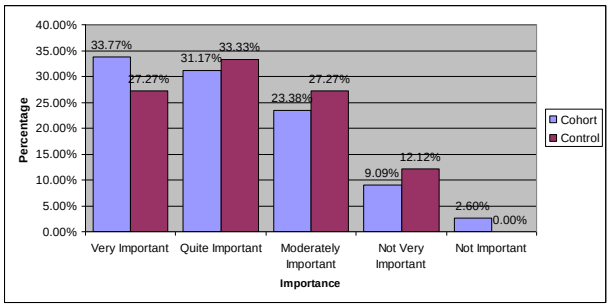
SpR leading the emergency



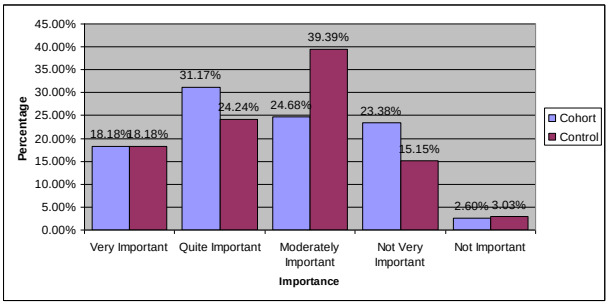
Anaesthetic SpR



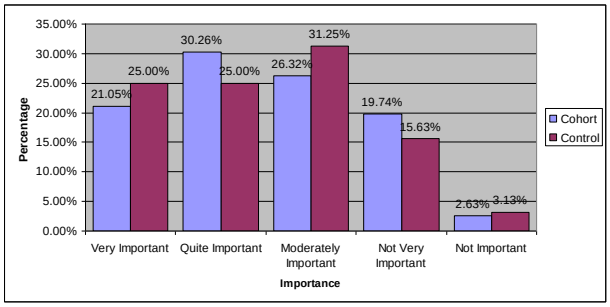
Ward sister



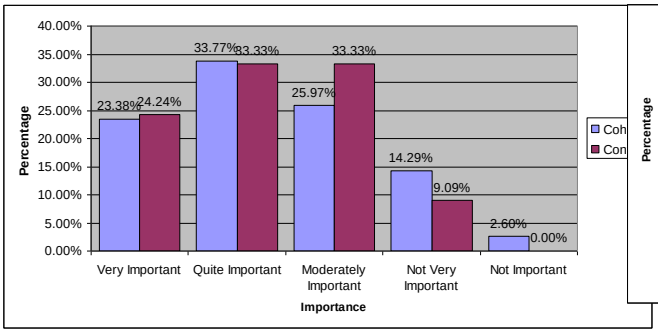
ICU nurses



Resuscitation officer



Staff nurses on ward



Porters on ward

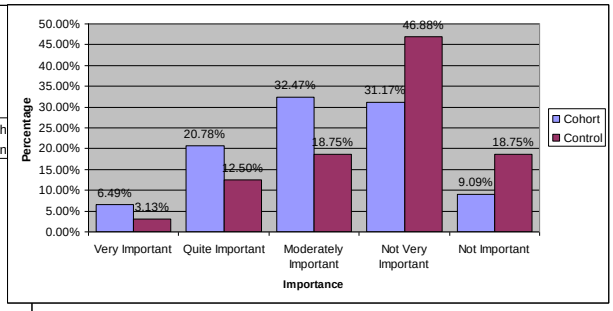


Table 28. Knowing the team

Team member	Cohort		Control		Difference between means [shading = rating in favour of cohort
	Mean	SD	Mean	SD	
Consultant	3.79	1.056	3.18	0.88	0.61
SpR leading the emergency	4.07	1.063	3.34	0.87	0.73
Anaesthetic SpR	3.58	1.080	2.19	1.0	1.39
Ward sister	3.84	1.077	2.24	1.0	1.60
ICU nurses	3.39	1.114	2.61	1.06	0.78
Resuscitation officer	3.47	1.113	2.47	1.14	1.00
Staff nurses on ward	3.61	1.078	2.27	0.94	1.34
Porters on ward	2.84	1.065	3.66	1.04	0.82

10 COMPARISON OF CHANGED SCORES OF COHORT AND CONTROL GROUPS OVER 4 MONTHS

To test whether the simulation training had any effect on the training benefit that trainees accrued from subsequent experience, we measured the changes in self-reported performance over the 4 months after the baseline measures. The following tables show that:

- The cohort improved, overall, at a greater rate than the controls in their confidence in handling emergencies.
- The cohort improved, in general, at a greater rate in performing tasks than did the control group.
- Overall, neither group became more willing to call for help –the observations suggest that they actually became less willing to do so 4 months after the baseline measures. This might be because of increasing felt competence. We do not know whether their decreased willingness is appropriate or not.
- There are no systematic changes in the groups' reasons for calling for help or not between the baseline study and 4 months later although the possible reasons for not calling help became less potent for the control group over that period.
- The control group changes more in relation to knowing the importance of knowing the team having started from similar levels of awareness. This was particularly so in relation to the importance of porters.

Table 29. Confidence levels of cohort and control groups in emergencies at baseline and 4 months later

Emergency	Cohort			Control			Difference between changes in means[shading shows greater improvement of cohort]
	Baseline mean	Mean after 4 months	Mean change	Baseline mean	Mean after 4 months	Mean change	
Respiratory	2.51	2.93	0.42	2.56	2.77	0.21	0.21
Cardiovascular	2.39	2.79	0.40	2.63	2.85	0.22	0.18
Gastrointestinal	2.61	3.00	0.39	2.93	3.00	0.07	0.32
Genitourinary	2.44	2.87	0.43	2.70	2.93	0.23	0.20
Neurological	2.47	2.42	0.05	2.28	2.44	0.18	0.13
Metabolic	2.34	2.65	0.31	2.58	2.68	0.10	0.21
Infectious	2.50	2.98	0.48	2.74	3.13	0.39	0.09
Multiple trauma	2.35	2.18	-0.17	2.27	2.10	-0.17	No difference

Table 30. Confidence in dealing with tasks at baseline and 4 months later

Task	Cohort			Control			Difference between changes in means[shading shows greater improvement of cohort]
	Baseline mean	Mean after 4 months	Mean change	Baseline mean	Mean after 4 months	Mean change	
ABC assessment	2.94	3.41	0.47	3.40	3.55	0.15	0.32
Apply monitoring	3.0	3.53	0.53	3.54	3.76	0.22	0.31
Give oxygen	3.21	3.72	0.51	3.51	3.74	0.23	0.28
Always wash my hands	3.59	3.57	-0.02	3.83	3.64	-0.19	0.17
Insert a cannula	3.21	3.45	0.24	3.34	3.60	0.26	0.02
Take bloods	3.47	3.70	0.23	3.66	3.73	0.13	0.10
Always wear gloves	3.57	3.69	0.12	3.73	3.81	0.08	0.04
Give drugs and fluids	2.88	3.22	0.34	3.11	3.42	0.31	0.03
Defibrillate	2.69	2.75	0.06	2.78	3.14	0.36	0.30
Call for help	3.56	3.76	0.20	3.78	3.74	-0.04	0.24
Declare an emergency	3.16	3.39	0.23	3.44	3.65	0.21	0.02
Verbalise possible diagnosis	2.61	3.08	0.47	3.07	3.13	0.06	0.41
Allocate tasks to team members	2.72	2.83	0.11	3.13	2.92	0.21	0.10
Maintain an overview	2.44	2.94	0.50	2.87	2.70	-0.03	0.53
Verbalise your treatment plan	2.63	3.00	0.37	3.09	3.11	0.02	0.35
Organise the team	2.56	2.87	0.31	2.89	2.89	0.00	0.31

Table 31. Confidence levels of cohort and control groups in calling for help at baseline and 4 months later

Circumstance	Cohort			Control			Difference between changes in means[shading shows greater relative change of cohort]
	Baseline mean	Mean after 4 months	Mean change	Baseline mean	Mean after 4 months	Mean change	
When you cannot get a line in	3.31	3.25	-0.06	3.25	3.09	-0.16	0.10
Patient is breathless	2.79	2.72	-0.05	2.59	2.45	-0.14	0.09
Patient needs 60% oxygen	2.82	3.07	0.25	2.72	2.52	-0.20	0.45
Patient is blue and breathless	3.73	3.74	0.01	3.58	3.42	-0.16	0.17
Oxygen saturations are below 94%	2.48	2.42	-0.06	2.13	2.06	0.07	0.13
When the patient needs 40% oxygen	2.46	2.47	0.01	2.13	1.97	-0.16	0.17
When the patient's respiratory rate is 38 BPM	3.41	3.41	0.00	3.16	3.06	-0.10	0.10
When the patient's heart rate is above 100 BPM	2.60	2.54	-0.06	2.32	2.19	-0.13	0.07
When the patients blood pressure is below 100 systolic	2.75	2.59	-0.16	2.36	2.09	-0.27	0.11

Respiratory arrest	3.95	3.95	0.00	3.96	4.00	0.06	0.06
Cardiac arrest	3.96	3.99	0.03	3.96	4.00	0.06	0.03

Table 32. Comparative factors in calling for help at baseline and 4 months later

Factor	Cohort			Control			Difference between changes in means[shading shows greater relative change of cohort]
	Baseline mean	Mean after 4 months	Mean change	Baseline mean	Mean after 4 months	Mean change	
I am happy to call for help whenever I need it	3.59	3.62	0.03	3.65	3.64	-0.01	0.04
I am less likely to call for help if my immediate senior is busy in clinic/theatre	2.42	2.45	0.03	2.32	2.69	0.37	0.34
I am happy to call for help at 2pm	3.52	3.56	0.04	3.06	3.62	0.56	0.52
I don't always call for help because I feel that I should be able to cope myself	2.69	2.26	-0.43	2.68	2.38	-0.30	0.13
If I don't know the diagnosis I'm reluctant to call for help straight away	2.98	1.92	-1.06	3.04	2.09	-0.95	0.11
I am happy to call for help at 4am	3.23	3.31	0.08	3.17	3.33	0.16	0.08
I sometimes don't know	2.65	2.32	-0.33	2.90	2.03	0.13	0.26

whom to call							
I like to get all the basic investigations done first before I call for help	2.12	2.99	0.87	1.93	3.30	1.37	0.50
I am less likely to call for help if my immediate senior is non-resident	2.65	2.25	-0.40	2.46	2.74	0.28	0.68
I am less likely to call for help if I have been previously criticised by my immediate senior for doing so	2.32	2.63	0.31	2.22	2.77	0.55	0.24
I am happy to call for help at 7am	3.29	3.44	0.15	3.30	3.39	0.09	0.06
I'm not sure what I am expected to cope with before calling for help	2.35	2.21	-0.14	2.58	2.03	-0.55	0.41

Table 33. Comparative views about knowing the team at baseline and 4 months later

Team member	Cohort			Control			Difference between changes in means[shading shows greater relative change of cohort]
	Baseline mean	Mean after 4 months	Mean change	Baseline mean	Mean after 4 months	Mean change	
Consultant	4.04	3.79	-0.25	4.03	3.18	-0.85	0.60
SpR leading the emergency	4.18	4.07	-0.11	4.18	3.34	-0.84	0.73
Anaesthetic SpR	3.92	3.58	-0.34	3.45	2.19	-1.26	0.96

Ward sister	4.02	3.84	-0.18	3.77	2.24	-1.53	1.35
ICU nurses	3.63	3.39	-0.24	3.09	2.61	-0.48	0.24
Resuscitation officer	3.74	3.47	-0.30	3.48	2.47	1.01	0.71
Staff nurses on ward	3.84	3.61	-0.23	3.65	2.27	-1.38	1.15
Porters on ward	3.03	2.84	-0.19	2.27	3.66	1.39	1.20

11 CONCLUSIONS

This extensive study has found no systematic differences between the cohort and control groups 4 months after the baseline measurements except in the case of recognising the importance of other members of the team [with the exception of porters]. We can only hypothesise reasons for this observation:

- We might not have identified the other areas in which differences can be observed
- The controls had undertaken more tasks and experienced more emergencies than the cohort and the results might indicate that learning in a concentrated simulation was equivalent to learning from more tasks in practice.
- The differences in valuing the team might be due to lack of direct experience of these team members in the controls and deliberate focus on them in the cohort's simulation training.

In relation to the speed of improvement of the cohort and the control groups during the 4 months under report, the cohort's greater relative improvement in handling emergencies and in performing tasks might be indicative of a factor worthy of further research – although the current size of observed difference is unlikely to be statistically significant.

Given the equivocal findings of this study, and of previous studies, and the continuing development of and enthusiasm for high fidelity simulation training – which does have an obvious face validity – we must conclude that further work is required to identify and measure the specific benefits of this training approach. It seems that the research methods used to date have not been adequate to this task and a new approach is required that asks different questions rather than trying to measure attributable changes in behaviour which is notoriously difficult in any educational environment.

APPENDICES:

QUESTIONNAIRES

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