Simulation via Instant Messaging-Birmingham Advance (SIMBA) model helped improve clinicians' confidence to manage cases in diabetes and endocrinology

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Abstract

Background: Simulation-based learning (SBL) has been increasingly used in both undergraduate and postgraduate medical training curricula. The aim of Simulation via Instant Messaging-Birmingham Advance (SIMBA) is to create a simple virtual learning environment to improve trainees' self-reported confidence in diabetes and Endocrinology.

Methods: This study was done as part of the continuous professional development for Health Education England West Midlands specialty trainees in diabetes and Endocrinology. Standardized transcripts of anonymized real-life endocrinology (endocrine session) and diabetes cases (diabetes session) were used in the simulation model. Trainees interacted with moderators through WhatsApp® in this model. All cases were then discussed in detail by a consultant endocrinologist with reference to local, national and international guidelines. Trainee acceptance rate and improvement in their self-reported confidence levels post-simulation were assessed.

Results: 70.8% (n=17/24) and 75% (n=18/24) strongly agreed the simulation session accommodated their personal learning style and the session was engaging. 66.7% (n=16/24) strongly felt that the simulation was worth their time. In endocrine session, there was a significant improvement in trainees' confidence in the management of craniopharyngioma (p=0.0179) and acromegaly (p=0.0025). There was a trend towards improved confidence levels to manage Cushing's disease and macroprolactinoma. In diabetes session, there was a significant improvement in trainees' confidence to interpret continuous glucose monitor readings (p = 0.01). There was a trend towards improvement for managing monogenic diabetes, hypoglycaemic unawareness and interpreting Libre readings. Overall, there was a significant improvement in trainees' confidence in managing cases that were discussed post-simulation.

Conclusion: SIMBA is an effective learning model to improve trainees' confidence to manage various diabetes and endocrine case scenarios. More sessions with a variety of other specialty case scenarios is needed to further assess SIMBA's effectiveness and application in other areas of medical training.

Background

The field of medical education has been constantly evolving over the years with utilization of relatively newer learning methods such as problem-based learning (PBL) and simulation-based learning (SBL). Despite the increasing popularity of SBL and PBL, lecture-based learning (LBL) is still the most widely used teaching method in both undergraduate and postgraduate medicine (1). Evidence from research has shown that LBL requires the least amount of resources compared to other learning methods. Studies have shown that students who undertake more LBL mostly memorize the facts taught and have lower levels of knowledge retention and application (2). Despite attempts to revise the curriculum, questions remain about how well the current model of lectures translates into the clinical environment (3). With recent developments, simulation is the latest tool that has been used to create real-patient encounters with artificial models, live actors or virtual reality patients. The goal of simulation is to replicate real-life

scenarios for the purpose of learning with feedbacks and assessments without putting patients at risk (4). SBL has also been proven to be a superior learning method compared to both LBL and PBL (5,6).

SBL has been widely used across disciplines in medicine especially in the more interventional specialties such as anaesthesiology (7,8), emergency medicine (9), cardiology (10) and radiology (11,12). To our knowledge, SBL has not been used in the field of endocrinology except for the use of SimMan 3G manikin for the management of endocrine emergencies (13). Although the use of SimMan in training provides trainees with realistic experiences in patient management, they are expensive and not widely available (14). Furthermore, even though the management of clinical emergencies is important, most cases in endocrinology are managed in an outpatient/clinic setting and hence endocrine emergencies simulation would not be representative of the training in this specialty. Therefore, there is a need for a minimal-cost SBL model with focus on day-to-day cases in Diabetes and Endocrinology.

Aim

The aim of SIMBA was to create a minimal cost simulation environment based on real-life situations to improve trainees' confidence to manage a variety of case scenarios in Diabetes and Endocrinology.

Methods

This study was conducted in July 2019 (endocrine session – pituitary case scenarios) and October 2019 (diabetes session – diabetes case scenarios), as part of a continuous professional and educational development for clinicians-in-training in Diabetes and Endocrinology in Health Education West Midlands (HEWM) deanery. All specialist trainee registrars specializing in Endocrinology and Diabetes or Metabolic medicine participated in the study.

SIMBA was based on interactive SBL through WhatsApp®. We initially identified five real-life case scenarios for endocrine and diabetes sessions. Following approval from specialists, anonymised transcripts were created on these case scenarios. These transcripts included medical history, clinical examinations, investigation results, imaging and other relevant information that would enable trainees to diagnose the case, propose management and follow-up plans. No patient identifiable data was included in the transcript. These transcripts were validated and approved by a consultant endocrinologist with specialist expertise to ensure that they portray real-life scenarios of respective cases. While the images used in endocrine session were approved by a consultant neuro-radiologist with a special interest in pituitary pathology, similar approval was obtained for continuous glucose monitoring and Libre readings for diabetes session (Fig. 1).

For endocrine session, standardized transcripts of five anonymized pituitary cases — Non-Functioning Pituitary Adenoma (NFPA), craniopharyngioma, macroprolactinoma, acromegaly and Cushing's disease — were prepared. For diabetes session, standardized transcripts of four anonymized diabetes cases —

interpreting Libre readings, interpreting continuous glucose monitor (CGM) readings, hypoglycaemic unawareness, and monogenic diabetes — were created.

In endocrine session, five moderators were chosen to participate in the study, whereas ten moderators were trained for diabetes session based on the feedback from endocrine session. These moderators acted as patient, senior clinician and multi-disciplinary team (MDT) liaison at different points of the simulation. Moderators familiarized themselves with the transcripts followed by at least three mock simulation sessions to ensure their proficiency. These moderators were then tested by the senior authors of the study to ensure there was no heterogeneity in the responses.

On the day of simulation, each moderator was assigned to a small group of trainees. All trainees brought their own computers/laptops/notebooks through which they were connected to the moderators via WhatsApp® Web application. Prior to initiating the simulation, the trainees were provided with the instructions shown in Fig. 2 via WhatsApp®. Once all trainees were ready, the simulation was initiated. If a trainee requested information that was unavailable on the transcript (e.g. ordering an inappropriate investigation or skipping a crucial step in diagnosis/management), they were prompted by the moderators that the information was not available or with appropriate advice to guide them back to the relevant step. During the endocrine session, the case scenario of non-functioning pituitary adenoma (NFPA) was run as a trial to allow participants to familiarize themselves to the simulation model. The case and its approach was then discussed in detail in line with current guidelines by an expert, which further helped the trainees to better understand the course of the simulation session. Following this, the trainees underwent simulation case scenarios for macroprolactinoma, craniopharyngioma, acromegaly and Cushing's disease, followed by respective case discussions with consultant endocrinologist.

During the diabetes session, the case scenario of interpreting Libre readings was chosen as a trial similar to NFPA in endocrine session. This was followed by case scenarios for interpreting CGM readings, hypoglycaemic unawareness, and monogenic diabetes, followed by case discussion with relevant approaches in detail.

During these discussion, the consultant focused on the appropriate approach to the cases, in relation to the evidence-based international, national and local hospital guidelines as appropriate for each specific condition (15–21).

The confidence of the trainees (measured using a Likert scale ranging from strongly disagree to strongly agree) in approaching different pituitary and diabetes cases was assessed pre- and post-simulation (22,23). These data were then categorised into three groups: (i) confident: for those who responded with strongly agree and agree; (ii) not confident: for those who responded with disagree and strongly disagree; (iii) unsure: for those who responded with agree somewhat, disagree somewhat and undecided. The confidence levels of managing cases pre- and post-simulation are reported using frequencies, percentages, and are displayed in bar charts. Due to the nature of the data, Wilcoxon rank sum tests (significance set at $p < 0.05$) were deemed appropriate (using STATA MP/4 (Statacorp 2017)) to

statistically compare confidence levels pre- and post-simulation. Significant tests are highlighted using an asterix.

Improvements in trainees' confidence levels pre- and post-simulation of simulated scenarios (endocrine session – NFPA, craniopharyngioma, macroprolactinoma, acromegaly, Cushing's disease; diabetes session - interpreting Libre reading, interpreting CGM reading, hypoglycaemic unawareness, and monogenic diabetes) vs. non-simulated scenarios (endocrine session – microprolactinoma, pituitary apoplexy, thyrotropinoma, gonadotropinoma, pituitary carcinoma; diabetes session - neuropathy, gestational diabetes, blood glucose meters, and ketone meters) were also displayed using frequencies, percentages, bar charts, and were also statistically tested using Wilcoxon rank sum.

In addition to views on the management of the cases, trainees were also asked to comment on their overall impression of the session, the consultant's contribution during discussion and their interaction with the moderators.

Results

Trainee satisfaction and confidence

In endocrine session, 70.8% (n=17/24) strongly agreed and 29.2% (n=7/24) agreed that SIMBA was successful, and it accommodated their personal learning style. 75% (n=18/24) strongly agreed and 25% (n=6/24) agreed that it was engaging. 66.7% (n=16/24) strongly felt that the simulation was worth their time and 33.3% (n=8/24) agreed to this.

There was a significant improvement in trainees' self-reported confidence levels for the management of craniopharyngioma (p=0.0179) and acromegaly (p=0.0025). There was a trend towards improved confidence levels to other simulated endocrine cases; macroprolactinoma (p=0.1498), and Cushing's disease (p=0.2040) (Figure 3A). We did not see such trend when trainees were assessed for their confidence to manage non-simulated pituitary cases; pituitary carcinoma (p=0.9335), microprolactinoma (p=0.1498), pituitary apoplexy (p=0.6913), gonadotropinoma (p=0.3705) and thyrotropinoma (p=0.3100) (Figure 3B).

Overall, there was a significant improvement in trainee's confidence in managing simulated pituitary cases (p=0.0002) compared to non-simulated cases (p=0.0655).

Regarding the diabetes session, there was a significant improvement in trainees' confidence for interpreting CGM reading (p=0.01). Other simulated cases all showed an improving trend; interpreting Libre results (p=0.1188), hypoglycaemic unawareness (p=0.4207), and monogenic diabetes (p=0.0744) (Figure 4A). Similar to endocrine session, we did not see any significant changes in trainees' confidence for non-simulated cases; neuropathy (p=0.6030), ketone meters (p=0.2506), gestational diabetes (p=0.2506), and blood glucose monitors (p=0.4257) (Figure 4B).

Overall, there was a significant improvement in trainees' confidence in managing simulated diabetes cases (p=0.0006) compared to non-simulated cases (p=0.0713). (Figure 5).

Trainees' feedback

In general, trainees reported they found the session interactive, practical and relevant and they recommended it should be integrated into their regular training in the future. Some of the comments are quoted below:

> "The simulation session was excellent. Very practical and relevant and led to good engagement and excellent discussion. Would definitely recommend continuing this and incorporating this into future training days".

They were also happy with the chair contribution as they found the chair to be knowledgeable, interactive and approachable.

> "This has been the most useful session so far and would very much like to have more of these sessions. Very useful contribution from the chair".

Despite all the positive feedback, we have also received some negative ones with regards to the interaction with moderators.

> "Great, initially some lag but this was very minimal when more moderators joined. Excellent session".

Discussion

SIMBA model was well received by the trainees as noted by their feedback. The use of an instant messaging platform (WhatsApp®) familiar to trainees, real-time interaction and specialist input could be the reasons for good reception.

We did not observe significant improvements in confidence levels for NFPA, macroprolactinoma, Cushing's disease, and hypoglycaemic unawareness. NFPA and hypoglycaemic unawareness were included in the mock scenarios and hence the trainees may not see much change in their confidence whilst familiarizing themselves with the simulation model. The approach to Cushing's disease has always been challenging even to experienced clinicians, therefore more simulation sessions might be needed for significant improvement in confidence.

To the best of our knowledge, this is the first ever real-time simulation training in endocrinology using a common social medium. WhatsApp® has been previously used as an education tool in basic health sciences, clinical health sciences and medical education; it has been used in pathology to share images on WhatsApp®, to promote discussions of interesting cases, to share quiz questions and other related academic issues (24,25). There is also evidence to show WhatsApp® as an acceptable and practical way

for teaching, connecting tutors from a range of specialties and across wide geographical area to respective trainees and students (26). In a recent review, Coleman et al. suggested WhatsApp® to be a suitable and effective teaching tool (27). However, it is important to note that none of the studies included in the review have used WhatsApp® as a simulation model. Other social media platforms that have been used in this field include Facebook, Twitter and YouTube, but there is limited evidence showing that they improve performance outcomes - more studies may be required to assess this (28,29). Furthermore, these social media were used to promote discussion and learning with information sharing (27), which is different from the model described here and hence not a good comparison.

The greatest benefit of the SIMBA model is that it can be delivered with minimal resources. The social media platform is free, and the moderators and trainees were familiar with the model, requiring very little time to train. The only cost entailed for the whole model was for the venue charges to conduct the training. And there is scope to do away from needing a room as the session can be conducted virtually. Three of our moderators were based internationally (one in Georgia and two in Malaysia), as a proof of concept to having a virtual SIMBA Model. Also, the moderators do not need clinical expertise for this model but only familiarity with medical terminology. This provides the opportunity to recruit junior clinicians and/or medical students as moderators. We applied this in our diabetes session where 70% of our moderators were medical students. In return for their time and effort, the moderators gain valuable experience in managing the discussed clinical scenarios and in the field of medical education.

Trainees reported delays in replying through WhatsApp® in the endocrine session; we resolved this in the diabetes session with better moderator to trainee ratio. We did not assess if there was a differential response depending on the level of clinical training in this study. There was also no control group to show that if the significant changes observed were due to our model independent of any confounders. We hope to include these and gather feedback from moderators in future studies to help further improve the model.

We are currently planning future studies which will include more baseline demographic information of the trainees (e.g.: level of training) to find out if there is a subgroup that will benefit more from the simulation (i.e. did the senior trainees perform better than the juniors). Dividing two groups of trainees into SIMBA and LBL with a higher sample size would provide us with more evidence for the use of this novel SBL model. Future sessions will also include a variety of other conditions in diabetes and endocrinology to assess the model's strength across the specialty. If these studies can prove that SIMBA is an effective teaching model, this could be used in the future beyond this specialty. More studies will be needed to assess if this model also has an impact on trainee's clinical practice.

Conclusion

SIMBA proved to be an effective teaching model for pituitary conditions and to improve doctors' confidence to interpret continuous glucose monitor reading and general management of complex

diabetes cases. More studies are needed to further assess the effectiveness of this model in other endocrine conditions.

Abbreviations

SIMBA	Simulation via Instant Messaging-Birmingham Advance
SBL	Simulation-based learning
PBL	Problem-based learning
LBL	Lecture-based learning
HEWM	Health Education West Midlands
NFPA	Non-functioning Pituitary Adenoma
CGM	Continuous Glucose Monitor
MDT	Multi-disciplinary team

Declarations

Ethics approval and consent to participate

The study was conducted as part of specialist training improvement initiative commissioned by Health Education West Midlands Diabetes and Endocrinology specialist training committee and hence did not require ethical approval. All participants had provided written consent to be part of this specialist training improvement initiative.

Consent for publication

Not applicable

Availability of data and materials

All data generated or analysed during this study are included in this published article.

Competing interest

The authors declare that they have no competing interests

Funding

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Authors contribution

EM and MD are the joint first authors having made all round contributions to the study. MA, EO and CYN formed the core moderator group for SIMBA model and helped design the transcripts and other relevant materials. JSC designed the data collection template and analysed the data. LS helped design the radiological investigations for the pituitary session. WA, JA, SS and MAK supervised the design and delivery of the simulation sessions. PK conceptualised and supervised the delivery of all aspects of SIMBA. All authors made substantial contributions to drafting and approving the final draft of this manuscript. The final version has been reviewed and approved by all the named authors. All authors have agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy and integrity of all parts of the work are appropriately investigated and resolved.

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Figures

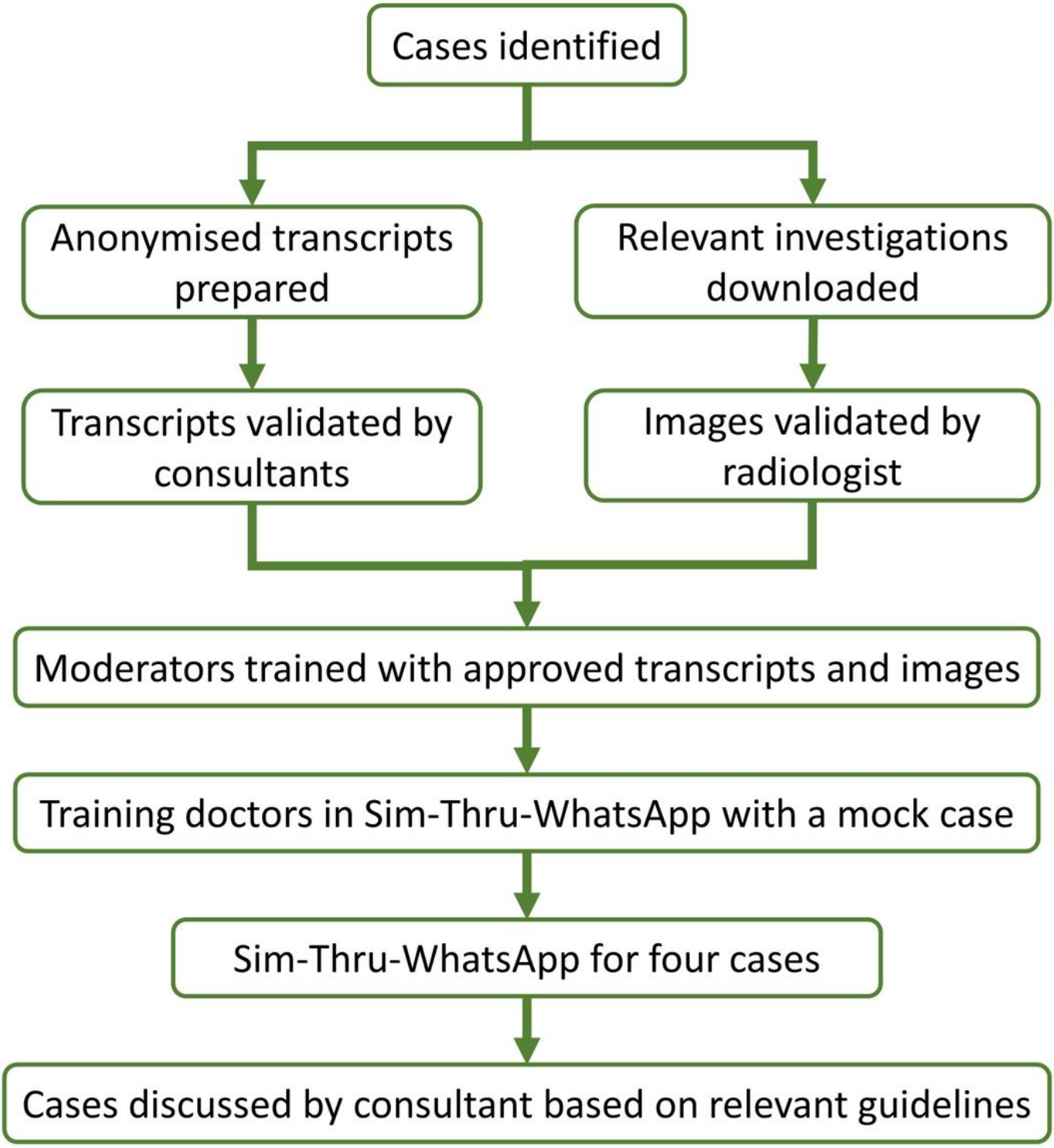

Figure 1

SIMBA Protocol

Simulation

Sim-thru-**WhatsApp®**: **Sim**ulation training in diabetes and endocrinology **thro**ugh **WhatsApp**

Please assess the patient as you would interact in a real-life clinic. Please request as many information about the patient as you like. However, please bear in mind you have 20 minutes to complete all of the following in each case:

1. History
2. Physical Examination
3. Investigations (forms will be provided)
4. Your diagnosis and proposed management plan to the MDT
5. Post-op follow-up plan (if indicated)

You will receive instructions as you go through the cases. Please feel free to ask the moderators if any doubts at anytime throughout the case.
You have about 20 minutes to complete the simulation, please type "ready" when you are ready to start.

Figure 2

SIMBA Instructions

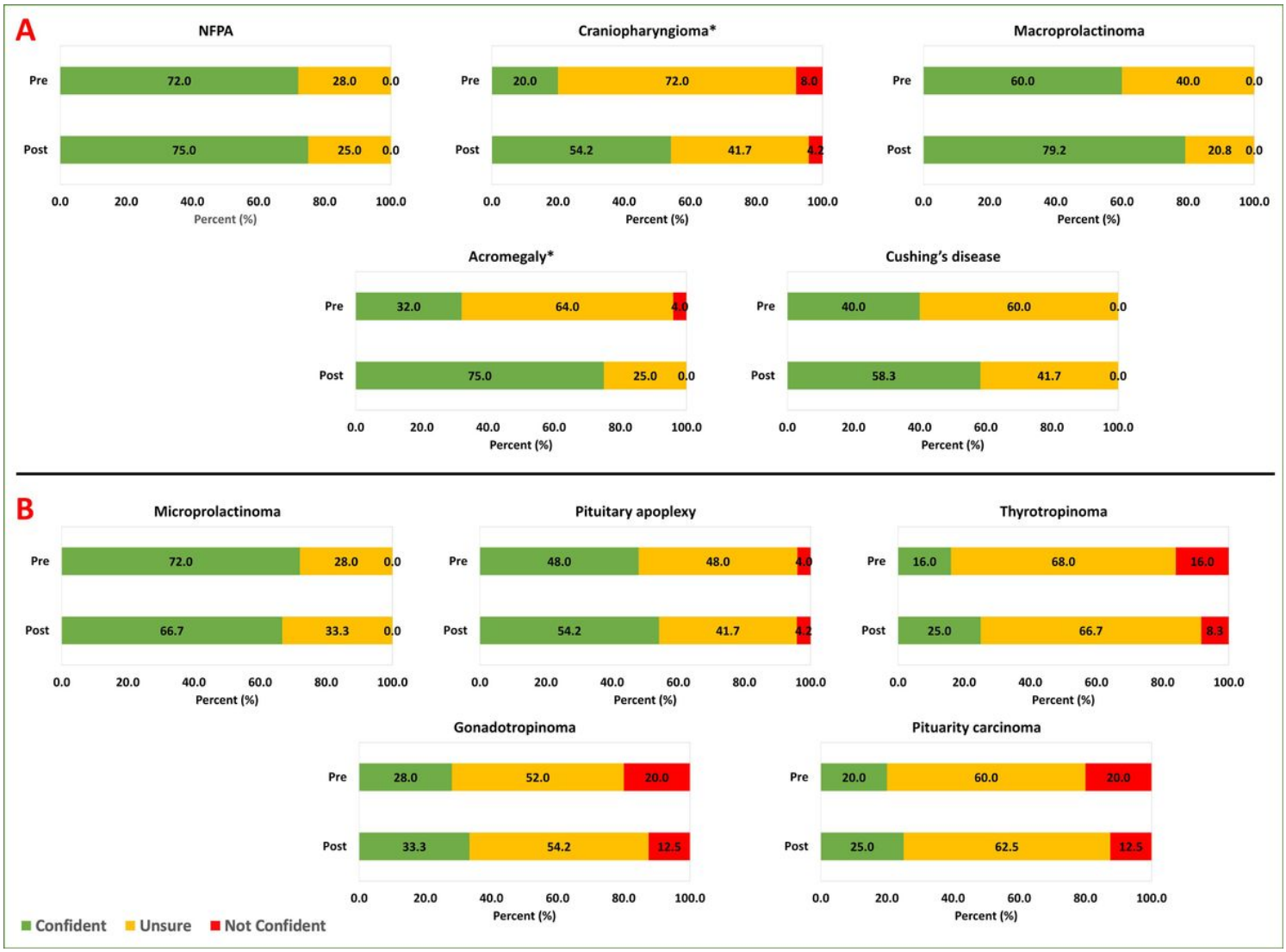

Figure 3

Trainees' self-reported confidence levels for the management of craniopharyngioma (p=0.0179) and acromegaly (p=0.0025)

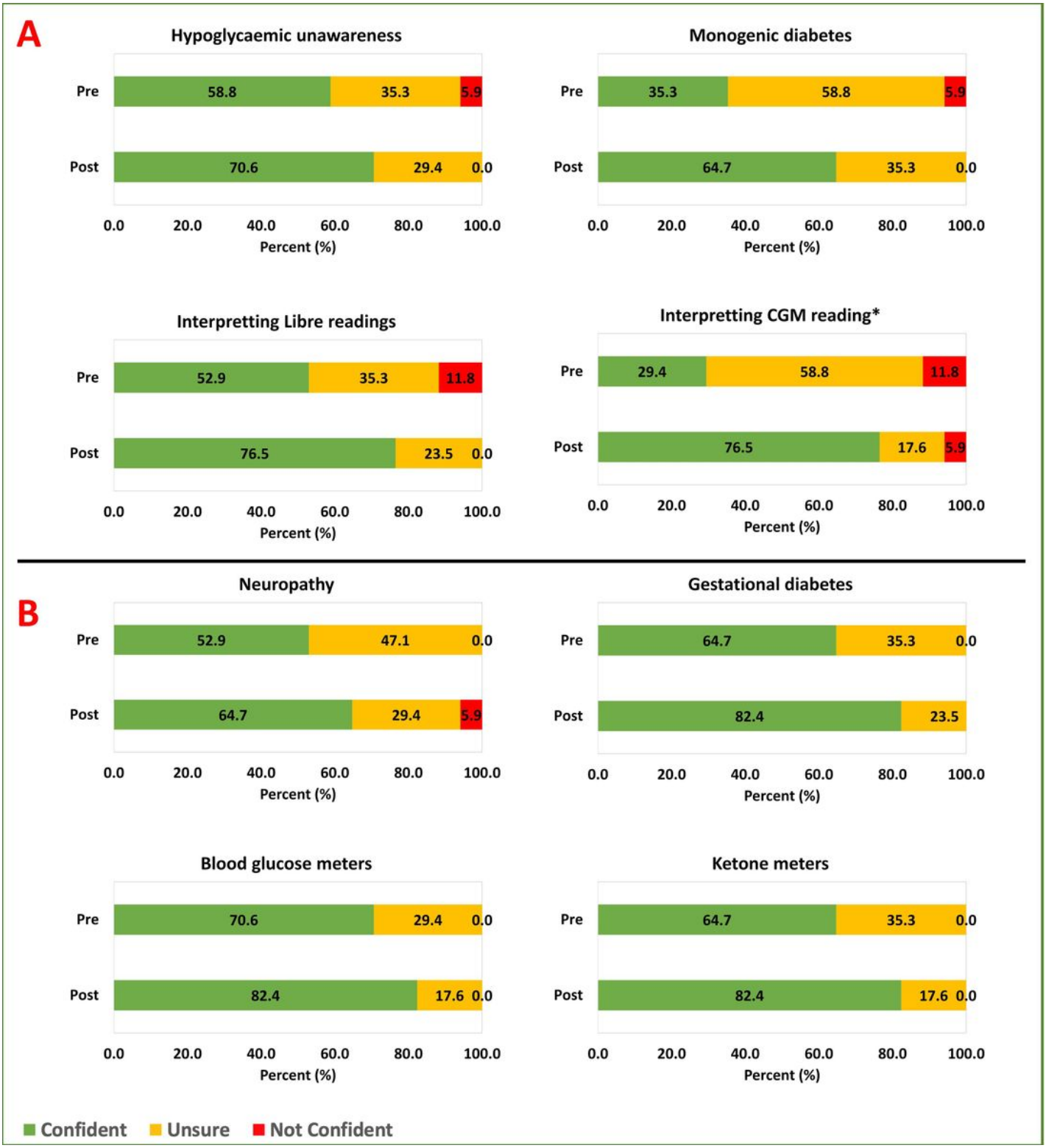

Figure 4

Trainee's confidence in managing simulated pituitary cases (p=0.0002) compared to non-simulated cases (p=0.0655)

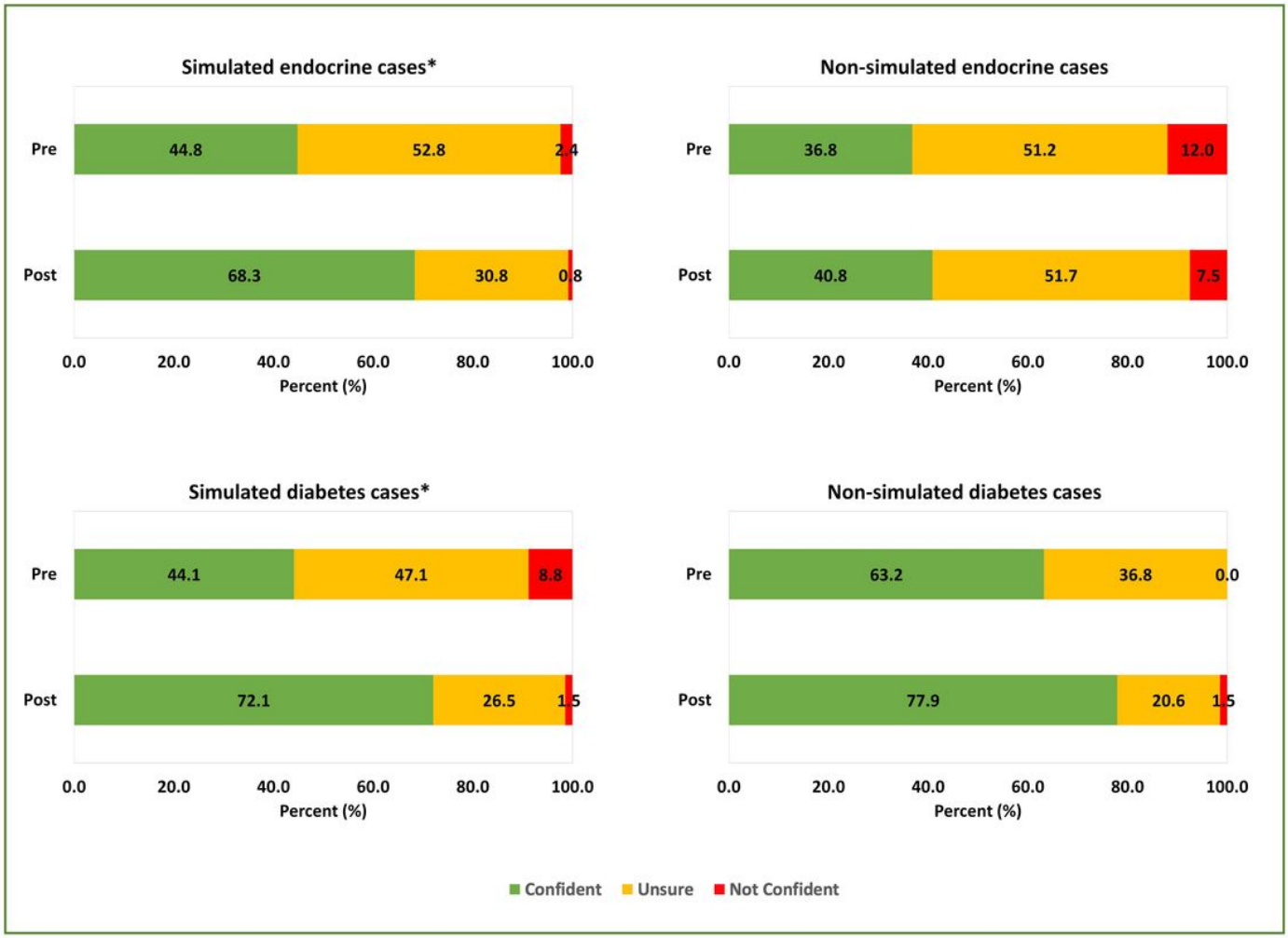

Figure 5

Trainees' confidence in managing simulated diabetes cases (p=0.0006) compared to non-simulated cases (p=0.0713)