

Subcostal Port and the Port Site Hernia: A Comparative Study

Do Undergraduate Objective Structured Clinical Examinations (OSCEs) Adequately Address the Domains Required of a Safe Physician?

Quality Improvement: Improving the Quality and Safety of Evening Ward Cover Medical Handover

Ectopic Pregnancy and Levonorgestrel - Only Emergency Contraception: A Systematic Review

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Tablet Personal Computer Use by Medical Students in China: A Quantitative Study

Treatment of Osteoarthritis in Basilar Thumb Joints - A Review Article



## Introduction

The World Journal of Medical Education and Research (WJMER) (ISSN 2052-1715) is an online publication of Doctors Academy Group of Educational the Establishments. Published on a guarterly basis, the aim of the journal is to promote academia and research amongst members of the multi-disciplinary healthcare team including doctors, dentists, scientists, and students of these specialties from around the world. The principal objective of this journal is to encourage the aforementioned, from developing countries in particular, to publish their work. The journal intends to promote the healthy transfer of knowledge, opinions and expertise between those who have the benefit of cutting edge technology and those who need to innovate within their resource constraints. It is our hope that this will help to develop medical knowledge and to provide optimal clinical care in different settings. We envisage an incessant stream of information flowing along the channels that WIMER will create and that a surfeit of ideas will be gleaned from this process. We look forward to sharing these experiences with our readers in our editions. We are honoured to welcome you to WJMER.

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## WELCOME

We are pleased to bring you the nineteenth edition of the World Journal of Medical Education and Research (WJMER). It comprises of several intellectually-stimulating articles which discuss pertinent topics and highlight the notable research that is being conducted throughout the world.

The opening article by Hussain and El-Hasani evaluates the incidence of port-site hernias with and without the use of a subcostal port. They draw the conclusion that a subcostal port reduces the occurrence of a port-site hernia.

Ashcroft explores the educational benefit of Objective Structured Clinical Examinations (OSCEs) for medical students who are completing their undergraduate degree. The author concludes that, while OSCEs aid the development of cognitive, affective and psychomotor skills, they fail to assess all domains that are activated by doctors during clinical practice.

Identifying that errors often occur during handover, Mustafa proposes a potential model which is intended to enhance this process. This has led to the introduction of an "on-call" proforma in the author's hospital.

Shurie and Lwande examine existing studies to analyse the proportion of ectopic pregnancies amongst women with a history of failure of emergency contraception. They find that the risk of an ectopic pregnancy increases when levornorgestrel-only emergency contraception is repeatedly used in the same cycle or close to ovulation.

In the subsequent article, Koech et al. examine the factors that affect the success of treatment of diabetic patients in Moi University Teaching Hospital, Kenya.

Wang et al. consider the way in which medical students in China use tablet computers and apps. The study shows that the practice is widespread amongst third-year medical students, and the authors thus suggest that medical schools should implement adaptive strategies.

The final article by Brennan and Knight studies the treatment of osteoarthritis in basilar thumb joints. They conclude that, while trapeziectomy is the most common surgical intervention for this condition, the best approach remains unclear.

We sincerely hope that you find each article in this edition informative, interesting, and enjoyable to read.

Ms Karen Au-Yeung Editor Ms Rebecca Williams Associate Editor Professor Stuart Enoch Editor-in-Chief

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## Subcostal Port and the Port Site Hernia: A Comparative Study

Hussain A\*, EL-Hasani S\*\*

#### Institution

Abstract

Background: A port site hernia is a complication of laparoscopic surgery with an average incidence of 1–6%. The aim of this study is to assess the incidence of port site hernias with and without the use of a subcostal port. **Methods**: This is a retrospective comparative study comparing the incidence of port site

hernias in 6424 and 4774 patients operated upon in 2011-2015 and 2000-2007, respectively. In the first group, laparoscopic procedures were performed using subcostal ports. The subcostal ports of 10-12 mm were inserted at the midclavicular line immediately at the subcostal region. The ports were closed at the skin level only. The patients were reviewed at 1, 3, 6, 12 and 24 months for bariatric surgery. The other patients were reviewed 6-8 weeks after the operations. This cohort was compared to a second group of patients using a non-subcostal port technique with a similar follow-up plan. The correlation and p-value were calculated.

Results: Of the 4774 patients who had operations during 2000-2007, eight port site hernias were reported, while none were reported in the other group. There were significant correlations and differences in the incidence of PIH between the two arms of the study. The p-value was 0.02.

**Conclusions**: The use of a subcostal port reduces the occurrence of a port site hernia.

#### Key Words

Subcostal Port; Port Site Hernia; Laparoscopic Surgery; Laparoscopic Cholecystectomy; Bariatric Surgery

#### **Corresponding Author:**

Dr Hussain Abdulzahra; E-mail: azahrahussain@yahoo.com

Introduction: Laparoscopic surgery is widely practiced with a high safety profile, despite known complications. One such complication is the port site incisional hernia (PIH), which has variable incidences that have been previously reported to be between 1-6%, but could be as low as 0.14% or as high as 22%. PIH can be a dangerous complication that requires a second operation: a bowel resection and a longer hospital stay with an extra cost<sup>3</sup>. PIH is frequently reported with large ports, usually more than10mm<sup>4</sup>; however, it can develop at 5mm ports<sup>5</sup>, <sup>6</sup>. The aim and primary end point of this study was to assess the incidence of PIH with and without a subcostal port.

Materials and Methods: The STORBE statement was used for this study's methodology. Since January 2011 to April 2015, one to two subcostal ports were used for all consequent 6424 patients (age group 11–91 years) who underwent different laparoscopic operations (see Table 1). The subcostal ports of 10-15mms were inserted at the

midclavicular line immediately at either subcostal region. Two senior surgeons performed the procedures. The subcostal port sites were inspected from the inside after withdrawal of the ports, before deflation, were closed at the skin level only. When the port was extended, closure at the sheath level under direct vision from outside and inside through laparoscopy was performed before deflation. This arm of the study was compared to 4774 patients (operated upon 2000–2007) who had their operations performed by the same team (with the same follow-up plan) using 10–15mm ports and a non-subcostal technique at sites other than the subcostal region (see Table 1). The patients' mean age was 52 years (range: 11–91). The Body Mass Index of the bariatric group was between 37 and 65 (mean: 48), while for the non-bariatric group the range was between 23 and 68 (mean: 26). The American Society of Anaesthesiologists (ASA) score ranged from 1 to 3. Our department of surgery approved the study protocol.

\*Doncaster & Bassetlaw Teaching Hospitals, Doncaster Royal Infirmary, Doncaster, UK Sheffield University, Western Bank, Sheffield S10 2TN, UK

\*\*King's College Hospital, Denmark Hill, Brixton, London SE5 9RS, UK

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Procedure	Number of Operations	Number of Operations	P-value
	in Subcostal Arm	in Non-Subcostal Arm	
Laparoscopic Nissen fundoplication	150	456	
Laparoscopic inguinal hernia repair	1203	1833	
Laparoscopic abdominal wall hernia	96	64	
Laparoscopic appendectomy	189	250	
Laparoscopic insertion of gastric band	1891	0	
Laparoscopic gastric bypass	851	550	
Laparoscopic sleeve gastrectomy	153	0	
Laparoscopic cholecystectomy	1620	1621	
Standard deviation	769.13	728.57	
SEM	258.09	257.59	
Total	6424	4774	0.6437

Table 1: Procedure type and number of subjects. 95% confidence interval(-609.69 to 954.44),

Study **Design**: Comparative study Setting: The study was conducted at two university hospitals and included two groups of patients who underwent laparoscopic surgery by two different techniques during 2011-2015 and 2000-2007, respectively. The difference in years between the two groups of patients is due to the change from previous non-subcostal techniques to the new subcostal technique. Prospectively recorded data on Excel file sheets for all laparoscopic procedures that were performed by our team were used for this study. The data of patients who developed PIH were collected from case notes. The patients were followed up within the clinic and clinically assessed by surgeons. Patients who were referred for symptoms of PIH were clinically assessed. If there was no clinical evidence of PIH, they were referred for imaging studies by ultrasound (USS) or computed tomography (CT) scans. Patients who had PIH were managed by further surgery.

**Participants**: Consecutive cohorts of patients aged\* 11–91 were recruited during two different periods as described above. The inclusion criteria were any patient who was referred for laparoscopic surgery, fit for general anaesthetics and pneumoperitoneum, in the age range of 11–91 years old, willing to have laparoscopic surgery and had no history of hostile abdomen or extensive laparotomies. The exclusion criteria were the age

group below 11 and above 91 years, those who had converted from laparoscopic to laparotomy, had extensive laparotomies and those who were not willing to have laparoscopic surgery. Both groups had undergone different kinds of laparoscopic upper gastrointestinal, bariatric and general surgical procedures.

**Variables**: The primary end point was the port site hernia.

**Data Sources/Measurement**: The data were collected from case notes and the preoperative recorded data by the two surgeons and stored on a hospital PC using an encrypted password. Members of the team who were not involved in the primary procedure performed post-operative clinical follow-up. When the PIH were identified, further assessment by the operating surgeon was arranged. The repair of clinically or radiologically confirmed PIH was then conducted.

**Bias**: The inclusion of consecutive series of patients reduced the selection bias. The assessment by a member of the team who did not take part in the operations did not completely eliminate the bias but possibly minimised it. The operating surgeons had assessed all patients with the diagnosis of PIH.

Study Size: Selection of large sample sizes to

demonstrate the statistical difference was vital for this study. To demonstrate the statistically significant difference – taken power to 80%, confidence 95%, 0.2% as the accepted lower incidence of PIH – a sample size of 3919 patients were needed in each arm of the study. A total of 7838 patients needed to be included. Thus, we included a larger sample to produce the required statistical significance.

**Quantitative Variables**: The number of PIH incidences was recorded, and the incidence was calculated for either group.

**Statistical Methods**: Statistical analysis was performed using two-sample t-tests to see whether the change in the mean between the two arms was actually significant. The standard deviation was calculated for both groups. The Pearson correlation coefficient was calculated to measure the strength of a linear association between the PIH and the use of the subcostal ports. A p-value < 0.05 was considered significant.

**Technique**: 1. The pneumoperitoneum was induced using a Veress needle at the umbilicus, followed by an incision in the subcostal area underneath the lower border of the costal margin, stretching the abdominal wall skin and muscle towards the pelvis (see Figure 1). The port was inserted in the direction of the intended dissection but not too oblique. It was crucial not to injure the lower margin of the rib, which may cause extensive post-operative pain. The port was closed at the skin level.



Figure 1: Subcostal port location in laparoscopic cholecystectomy

2. A traditional non-subcostal port technique was used for the second group of patients. For the bariatric patients (RYGB, LSG, AGB), we used five ports: one 5mm epigastric port, one 5mm right-side port 2 inches below the umbilicus at the midclavicular line, one 10-12mm port at the umbilicus level at the midclavicular line, one 10-12mm port at the epigastric area 3 inches below the xiphi sternum, and one 10mm port at the same level on the right side. For Nissen fundoplication, the same ports as mentioned above were used except that the left 10–12mm port was replaced by a 5mm port. For inguinal hernia repair, we used a 10-12mm port at the umbilicus and two 5mm ports at the respective side of the umbilicus 2 inches laterally and at the midclavicular line. For the abdominal wall hernia repair, we used a 10-12mm port at 3-4 inches at the umbilicus and two 5mm ports 3 inches above and below the 10–12mm port at the anterior axillary line. For the appendectomy, we used one 10mm port at the umbilicus and two 5mm ports at the suprapubic area and on the left side 3 inches from and at the umbilicus level. Lastly, for the cholecystectomy, we used a 10-12mm port at the umbilicus and the epigastrium (just below the xiphisternum) and two 5mm ports at the left subcostal and 3 inches from and at the umbilicus. Follow-up of bariatric patients were performed according to our local protocol at 1, 3, 6, 12 and 24 months. Other patients were followed up with 6 weeks after surgery, and then general practitioners referred patients when they developed PIH.

**Results**: The first arm included 6424 laparoscopic procedures using subcostal ports, and no port site hernias were reported. For the other arm of the study (4774 patients), 8 PIHs were reported. There was no significant difference between the two arms with regard to the number of operations, with the two-tailed p-value = 0.643. The standard deviations were 729.98 and 728.57 for the first group and second group, respectively. Two hernias developed after cholecystectomy, and one hernia developed after Nissen fundoplication. The other five hernias developed after a groin hernia repair. There was a strong linear correlation between the non-use of a subcostal port and the incidence of PIH. The Pearson correlation coefficient was 1. There was a significant difference in the incidence of PIH between the two arms, with the p-value = 0.02(see Table 2).

**Discussion:** The laparoscopic ports locations were varied for each procedure according to the surgical preference, anatomical site, extent and type of the operations, body habitus and the presence of previous scars or abdominal wall changes. PIH is a rare complication, and eight (0.14%) PIH were reported in a long-term study of more than 5000

Technique	Subcostal Port Use	Non-Subcostal Port Use
Number of operations in subcostal	6424	4774
Number of port site incisional hernia PIH	0	8
t-test using 2-samples analysis, p-value	0.021058547	

#### Table 2: The incidence of PIH and p-value

patients in 2009<sup>7</sup>. Different techniques were suggested to reduce the incidence of PIH<sup>8-11</sup>.

We used 11–12mm ports in the left subcostal area after induction of pneumoperitoneum for laparoscopic anti-reflux surgery. We used bilateral subcostal ports for gastric bypass. Five (0.3%) epigastric PIH were confirmed after 1620 laparoscopic cholecystectomies (LC). The epigastric port was 10mm but was extended to about 3–5cm in 10% of cases to extract a large gallbladder, and hence, we had problems with 5 incisional hernias even after the closure of the sheath with a PDS suture, which failed or was inadequate. Authors reported a higher incidence of PIH at the epigastric port that were used for extracting specimens<sup>12</sup>.

To address the problem of PIH, we adopted a different port insertion approach in LC where subcostal 10mm ports were used and no epigastric port was used. The extraction port could be extended if the gallbladder or the gallstones were large (see Figure 1).

For laparoscopic repair of the inguinal hernia, we inserted a 10mm port at the umbilicus for camera and mesh deployment. The problem with this port was the difficult closure in high BMI patients or those with thick subcutaneous fat; thus, the risk of incisional hernia was possible. We changed the technique to insert a 5mm port at the umbilicus for the camera and adopted a left subcostal port (contralateral to the hernia site), where we introduced the mesh and the Vicryl stitch through to close the peritoneum. In the laparoscopic appendectomy, we used the subcostal port at the left side. On occasions when the appendix was thick and could not be extracted through a 5mm port, we used a larger port - 10mm, 12mm or even sometimes 15mm – to extract the bulky appendix without contaminating the abdominal wall and without the need for the bag. Previously, we extended the suprapubic port and closed the fascia with a PDS suture, and as a result, we had one PIH. The risk of PIH after bariatric surgery could reach 1.6%<sup>13</sup>. We used subcostal ports for gastric bypass,

sleeve gastrectomy and gastric band insertion, and no PIH was reported for more than 2000 patients during the follow-up period of 2 years.

There was no need to close any of the muscle layers or the fascia at the subcostal port because the muscles will contract at or above the costal margin, preventing development of PIH. There were occasions where the left subcostal port in LC needed extension to extract large specimens and/or large stones. In these cases, we closed the sheath using a PDS suture.

The post-operative pain was managed by first-line analgesic ladder medications. Bearing in mind the spectrum and the workload of minimal access surgery, the use of a subcostal port in emergency and elective laparoscopic surgery is expected to reduce the incidence of PIH and its complications.

Limitations of the Study: This was a retrospective hernia study of consequent cohorts of patients using subcostal 10–12mm ports in one arm and non-subcostal ports in the second arm. Similar to other hernia studies, it has the inherent weakness of long-term follow-up. However, we conducted the full 2 years clinical follow-up of more than 2000 patients who underwent bariatric surgery, who were at risk of developing PIH. The rest of the patients were seen 6 weeks after the operation for either arms, and only early PIH was potentially detectable. The general practitioners assessed and referred patients to our unit if any suspected or diagnosed PIH. The true incidence of asymptomatic PIH may be underrepresented, especially for non-bariatric patients for whom we had a general practitioner assessment after our clinical 6 weeks of postoperative follow-up. It was not possible to review and assess 11,000 patients with longer follow-up (apart from the 2000 bariatric patients).

In the UK, about 60,000 LC are performed each year. If we take our very low 0.3% incidence of PIH following LC as a benchmark, then 185 PIH are expected to develop after LC each year, which need

repairs and put extra costs and pressure on the already stretched health system. If we consider the workload and the different practices of laparoscopic surgery in the UK, the impact is even larger.

**Conclusion:** The use of a subcostal port reduces the risk of port site incisional hernia. Changing from a classic to subcostal technique is expected to reduce the incidence of port site hernias, the morbidity of surgery and the cost of treatment.

#### Declarations

#### Authors' Contributions:

S El-Hasani contributed by ideation, collection of the data and approving the final version.

A Hussain, drafted the study, analysed the data, did the statistical analysis, formatted the tables and figure and approved the final version.

#### Financial Support and Sponsorship:

Authors confirm no financial support and no sponsorship for this study.

#### **Conflicts of Interest:**

Both authors declare no conflict of interest

#### References

- Di Lorenzo N, Coscarella G, Lirosi F, Gaspari A. Port-site closure: a new problem, an old device. JSLS. 2002; 6:181–183.
- 2. Di Lorenzo N, Coscarella G, Lirosi F, Pietrantuono M, Susanna F, Gaspari A. Trocars and hernias: a simple, cheap remedy. Chir Ital. 2005;57:87–90.
- Ashwin Rammohan, R.M. Naidu. Laparoscopic port site Richter's hernia – An important lesson learnt. Int J Surg Case Rep. 2011; 2: 9–11.
- Tonouchi H., Ohmori Y., Kobayashi M., Kusunoki M. Trocar site hernia. Arch Surg. 2004; 139:1248–1256.

- 5. Audrius Dulskas, Raimundas Lunevičius, and Juozas Stanaitis. A case report of incisional hernia through a 5 mm lateral port site following laparoscopic cholecystectomy.J Minim Access Surg. 2011; 7: 187–189.
- 6. Miya Yamamoto, Laura Minikel, and Eve Zaritsky.Laparoscopic 5-mm Trocar Site Herniation and Literature Review.JSLS. 2011; 15: 122–126.
- Hussain A, Mahmood H, Singhal T, Balakrishnan S, Nicholls J, El-Hasani S.Long-term study of port-site incisional hernia after laparoscopic procedures.JSLS. 2009;13:346-9.
- 8. Hussain A, Mahmood H, Shuaib S, El-Hasani S.Prevention of trocar site incisional hernia following laparoscopic ventral hernia repair.JSLS. 2008;12:206-9.
- 9. Shafer Z. Port closure technique. Surg Endosc. 2007;21:1264–1274.
- Chiu CC, Lee WJ, Wang W, Wei PL, Huang MT. Prevention of trocar wound hernia in laparoscopic bariatric operations. Obes Surg. 2006;16:913–918.
- Morenzo-Sanz C, Picazo-Yeste JS, Manzanera-Diaz M, HerreroBogajo ML, Cortina-Oliva J, Tadeo-Ruiz G. Prevention of trocar site herniae: description of the safe port plug technique and preliminary results. Surg Innov. 2008;15:100–104.
- 12. Bunting DM1. Port-site hernia following laparoscopic cholecystectomy.JSLS. 2010 ;14:490-7.
- Pilone V1, Di Micco R2, Hasani A3, Celentano G2, Monda A2, Vitiello A2, Izzo G2, Iacobelli L2, Forestieri P2. Trocar site hernia after bariatric surgery: our experience without fascial closure.Int J Surg. 2014;12 Suppl 1:S83-6.



### Do Undergraduate Objective Structured Clinical Examinations (OSCEs) Adequately Address the Domains Required of a Safe Physician?

Ashcroft J

#### Institution

Imperial College London, Kensington, London SW7 2AZ, UK

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#### Abstract

**Issue:** This work offers an educational analysis of Objective Structured Clinical Examinations (OSCEs) as assessments for safe soon-to-be junior doctors. Analysis of both OSCE domains, Bloom's taxonomy, and Bloom's domain hierarchy was undertaken to assess the components OSCEs cover in the undergraduate medical school curriculum.

**Evidence:** The results of this analysis suggest the domains of patient safety and quality improvement, research and development, and education and training are inadequately assessed through OSCEs. Suggestions of possible implementations to further the assessment of medical students are highlighted.

**Implications:** OSCEs offer a great foundation for the analysis of cognitive, affective, and psychomotor skills in soon-to-be doctors, however do not adequately assess the broad spectrum of domains required of safe practicing physicians. OSCEs may therefore benefit from expansion or adjunct stations, especially in order to serve as exit examinations for final year medical students becoming junior doctors.

#### Key Words

Education & Training (See Medical Education & Training); Medical Education & Training; Assessment; Competency.

#### Corresponding Author:

Dr James Ashcroft; E-mail: james.ashcroft17@imperial.ac.uk

#### Introduction

To approach practical final year Objective Structured Clinical Examinations (OSCEs), medical students must draw from their cognitive, affective and psychomotor skills to successfully traverse each general medical station. This piece explores whether OSCEs are an adequate assessment of soon-to-be junior doctors and what could be further included to encourage students to develop as safe practicing physicians.

### Domains and their Application to OSCEs:

The identification of 'domains', taxonomies used to categorise intended learning outcomes and assessment criteria in examinations, is an incredibly useful tool for the construction and blueprinting of a curriculum. A prominent educational domain example is Bloom's taxonomy, which identifies cognitive, affective and psychomotor domains for the direction of courses and assessment.<sup>1</sup> These domains can be used in conjunction with Bloom's domain hierarchy which creates a ladder in which to move from the simple retention of knowledge to the peak of evaluation and insight into a skill.<sup>1</sup> The levels of Bloom's domain hierarchy are as follows: knowledge > comprehension > application >

analysis > synthesis > evaluation.<sup>1</sup> The OSCE expects a minimum of 'comprehension' for all domains, which is developed from simple 'knowledge' in preclinical years of the medical curriculum. The OSCEs then assess the transition of the soon to be junior doctors from 'comprehension' to 'application', applying their undergraduate training to specific clinical stations. Transitioning to the next level 'analysis' will come through ongoing reflection throughout the student's clinical career.

The cognitive domain revolves around the application of the comprehension of medical physiological and pathological principles. Broad examples of stations which test the cognitive domain include history taking stations, interpretation of investigations and results, and formulating differential diagnoses following examinations. The affective domain of Bloom's taxonomy traditionally includes components such as listening and communication, values, organisation and prioritisation. It is assessed through the student's attitudes towards clinical stations which must be judged as appropriate to pass practical examinations. It is difficult to measure a student's

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maturity, responsibility, and values in a short OSCE station. This may mean that the affective domain stays at the 'knowledge' level of Bloom's hierarchy, where students have knowledge of what is expected of them as opposed to the 'comprehension' level, understanding the reason why affect is important and how to apply that to real people. The psychomotor domain of Bloom's taxonomy is assessed through the physical stations of the OSCEs which revolve around examinations. Psychomotor skills are often undervalued, and often in 'acute assessment' stations the focus moves more to the interpretation of clinical information as opposed to physical assessment. It is common in OSCE stations that students can ask for investigation/intervention results, due to time and physical constraints, as opposed to physically performing these skills. Some stations will ask for the identification of equipment such as chest drains and airway adjuncts, however will not require the student to utilise the tools. These methods assess only the 'knowledge' level of Bloom's hierarchy.

#### The Domains Required of a Safe Physician

Good Medical Practice Professional Values and Behaviours guidance and the Framework for Professional Capabilities, both published by the General Medical Council, UK, as a blueprint for 'Outcomes for Graduates', jointly advise that postgraduate doctors should excel in the domains of:

- Knowledge, skills and performance;
- Patient safety and quality improvement;
- Communication, partnership, teamwork and leadership;
- Maintaining trust;
- Health promotion and illness prevention;
- Safeguarding vulnerable groups;
- Research and development;
- Education and training.<sup>2, 3</sup>

Although these guidances are not utilised for undergraduate medical school examinations or incorporated into them, they do bring into play several unique values that some consideration should be given to for inclusion.

## Communication, Partnership, Teamwork and Leadership

Communication, partnership, teamwork and leadership revolves around the affective domain of Bloom's taxonomy. OSCEs do examine communication between the student and the patient throughout examination and history taking stations, however OSCEs do not involve any partnership, teamwork, or leadership. This is due to the structure of final year examinations which require each student to approach each station individually. OSCE stations often ask students how they would manage a patient's long term illness, and the student is expected to explain the inclusion of a multidisciplinary team and how teamwork with other professional is required for all patients, but this touches the 'knowledge' level of Bloom's hierarchy with no investigation of the student's comprehension of the roles of supporting healthcare workers. With the growing evidence for simulation in education, a simulated OSCE station which involves teamwork with a multi-disciplinary team to manage a patient should be considered for future inclusion which would test the higher levels of Bloom's hierarchy.

#### **Maintaining Trust**

Maintaining trust may be aimed at either maintaining trust with patients over a long period of management or being able to maintain trust between colleagues whilst working in a clinical setting. OSCEs require students to build and maintain trust with patients in order for them to build confidence in the student to divulge information about their medical condition. Brief stations may not be able to reveal the student's ability to maintain trust over a long period of time, however give a good indication of their approach to patients and whether you can envision them maintaining trust as a certified physician. As maintaining trust is valued more and more in the current healthcare climate, it may be that OSCEs cannot fully approach this domain and alternatives are required. These alternatives could include simulations, portfolio stations, or testimonials from clinicians or patients.

#### Patient Safety and Quality Improvement

These clinical skills are essential to becoming a safe physician. Quality improvement is required to develop the processes around us to improve patient outcomes which requires the application of comprehension of healthcare systems in order to plan, do, study, and act upon a healthcare process. There is no inclusion of quality improvement in the OSCE, however evidence of an implemented quality improvement project to be presented in the OSCE could both broaden the student's understanding of the healthcare system and having great benefit for the healthcare service.

#### **Research and Development**

There is debate around the question 'should every doctor be involved in research?' however, with today's ever growing academic advances and the spread of fake news, it is essential that doctors are able to engage in research and adequately critically appraise it. A research and development station within the OSCE, requiring students to critically appraise an abstract or research paper, could assess

students comprehension of a clinical subject and encourage them to develop appraisal skills necessary to base their clinical decisions in their future practice.

#### **Education and Training**

As a clinician, education and training becomes imperative to train future physicians to be safe and to engage doctors with the most up to date advances in the healthcare field. Educational evidence, or the presentation of up to date clinical practices in the OSCE, could assess the student's application of their comprehension of a clinical component of the curriculum whilst evaluating their ability as a trainer.

#### Conclusion

OSCEs offer a great foundation for the analysis of cognitive, affective, and psychomotor skills in soonto-be doctors however do not adequately assess the broad spectrum of domains required of safe practicing physicians. OSCEs may therefore benefit from expansion or adjunct stations, especially in order to serve as exit examinations for final year medical students becoming junior doctors.

#### References

- Anderson, L.W., Krathwohl, D.R., Airasian, P., Cruikshank, K., Mayer, R., Pintrich, P., Raths, J. and Wittrock, M., 2001. A taxonomy for learning, teaching and assessing: A revision of Bloom's taxonomy. New York. Longman Publishing. Artz, AF, & Armour-Thomas, E. (1992). Development of a cognitivemetacognitive framework for protocol analysis of mathematical problem solving in small groups. Cognition and Instruction, 9(2), pp.137-175.
- General Medical Council. 2013. Good Medical Practice. [ONLINE] https://www.gmc-uk.org/ ethical-guidance/ethical-guidance-for-doctors/ good-medical-practice [Accessed 1 April 2018].
- General Medical Council. 2017. Framework for professional capabilities, [ONLINE] Available at: https://www.gmc-uk.org/-/media/documents/ generic-professional-capabilities-framework--0817\_pdf-70417127.pdf Accessed 1 April 2018].

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### Quality Improvement: Improving the Quality and Safety of Evening Ward Cover Medical Handover

Mustafa Q

Institution Wexham Park Hospital, Wexham St, Slough SL2 4HL, UK

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#### Abstract

**Aims**: In the 'Medical Department' at a District General Hospital, Foundation Year One (FY1) Doctors are responsible for evening ward cover (17:00- 21:00), where outstanding jobs are accepted from outgoing teams. Jobs which are not completed by the on-call team are then passed on to the night team. Handover, particularly of temporary "on-call" responsibility, has been identified as a point where errors are likely to occur. This multicycle quality improvement project demonstrates a potential model of improvement at hospitals which use a bleep system of handover.

#### Material and Methods:

**PDSA 1:** *Identifying the improvement focus*: Medical FY1 surveys (n = 20) covering RCP domains, identified weaknesses in handover and generated improvement recommendations.

**PDSA 2:** Baseline analysis: Audit of ward to 'on-call' handover practices against RCP criteria, to assess the quality of information provided (n = 5 days).

Standards: We evaluated quality of received handover sheets with "Acute Care Toolkit: 1 (RCP)"

**PDSA 3:** *Intervention:* Pilot introduction of a structured handover sheet and its use audited against RCP criteria. (n = 5 days).

**Results:** Only 46% of FY1s agreed that the handover process was done well. Only 5 doctors felt "almost always" able to comfortably communicate jobs they had been unable to complete to the night team. Less than 15% of all FY1 doctors used a structured handover sheet, despite 100% strongly agreeing that the quality of evening handover affected the night. Additionally 80% strongly agreed in the introduction of a handover sheet.

The baseline audit identified that key parameters were not being documented. Only 8% of all jobs had all three patient identifiers with S.B.A.R documented in less than half. Subsequently, 8% of all jobs audited were not completed. Introduction of a structured handover sheet resulted in 100% completion of all jobs being handed over by increasing the quality of information documented.

**Conclusion:** The QIP found that we are not meeting the standards for effective handovers. The handover process is strengthened by introducing an "on-call" pro-forma, allowing clearer documentation of patient identifiers, past history, jobs and clinical priority, facilitating clear baton passing.

The handover sheet has now been made available and re-auditing has demonstrated that it is a useful addition to the evening handover process.

#### Key Words

Quality Improvement; Audit; Safety; Handover

#### **Corresponding Author:**

Dr Qamar Mustafa; E-mail: qamar.mustafa@nhs.net

#### Introduction

In the 'Medical Department' at our District General Hospital, Foundation Year 1 (FY1) doctors are responsible for 'on-call' evening ward cover (17:00-21:00), where outstanding jobs are accepted from outgoing teams. Jobs which are not completed are passed on to the night team.

This system of 'handover' is where responsibility for immediate and outgoing care is transferred between different medical teams.<sup>1</sup> Good handover, underpinned by clear communication, ensures continuity of care is maintained, identifying to incoming teams unstable, sick patients and important, time critical tasks with a clear baton-passing of responsibility.<sup>5</sup>

Handover, particularly of temporary "on-call" responsibility, has been identified as a point where errors are likely to occur.<sup>1,2</sup> Suboptimal handover, particularly in poor communication, has been noted to be a major preventable cause of harm, giving rise to delayed decision making, misidentification, repetitions and poor communication with patients and their families.<sup>1,2</sup>

Anecdotal evidence for FY1 doctors suggests this on-call handover process at our hospital is currently unsatisfactory, leading to instances of poor communication which have generated this multicycle quality improvement project.

#### Aim

The aims of the project were:

- 1. To formally identify weaknesses in the evening on-call handover process at WPH and test the intervention using multiple Plan, Do, Study, Act (PDSA) cycles.
- 2. To develop a quality improvement project to improve patient handover, based on recommendations.
- 3. To introduce an on-call evening ward cover FY1 pro-forma (handover sheet)
- 4. To develop audit standards to ensure recommendations are maintained
- 5. To improve satisfaction with the evening oncall handover process within Medicine.

#### Material and Methods

#### PDSA 1: Identifying the Improvement Focus:

In March 2018, a questionnaire (appendix: 1) was distributed to FY1's (n = 20) covering domains and identifying weaknesses in handover. From these results we generated improvement recommendations based on our local practices.

<u>Standards</u>: Domains of best practice, as stipulated by 'Safe Handover, Safe Patient' guidelines and the 'Acute Care Toolkit 1: Handover', produced by the Royal College of Physicians (RCP).<sup>1</sup>

#### PDSA 2: Baseline Analysis of Documentation During Evening 'On-Call' Handover:

Audit of ward to 'on-call' handover practices against RCP criteria, to assess the quality of information provided (n = 5 days).

<u>Standards</u>: We evaluated the quality of received handover sheets, over one week, with "Acute Care Toolkit: 1 (RCP)".<sup>1</sup>

#### PDSA 3: Intervention– On-Call Proforma:

On-call doctors were briefed about the ideal

handover process and this was discussed on an individual basis prior to FY1's going on-call. Pilot introduction of a structured handover sheet (Figure 2) and its use audited against RCP criteria. (n = 5 days).

<u>Standards</u>: We evaluated the quality of received handover sheets, over one week, with "Acute Care Toolkit: 1 (RCP)". We compared the results with our baseline analysis.<sup>1</sup>

## Summary of Audit Standards (Expected Compliance of 100%):

- 1. Ensure that on-call ward cover doctors use an "on-call proforma" to document jobs.
- 2. Ensure that all jobs handed over include all three patient identifiers, including:
  - Patient name,
  - Hospital number
  - Date of birth.
- 3. Ensure that all incoming jobs include correct location, including the ward and bed number.
- 4. Ensure that any outstanding jobs are handed over to the night team.

#### Results

#### PDSA 1: Identifying the Improvement Focus:

In the qualitative arm of this project, the response rate was 71% (20/29) of FY1s. All had experienced at least one evening on-call ward cover shift. Only 46% of FY1s 'agreed' that the handover process was done well (mean 2.7).

Handover is highly variable, with different communication strategies used. Only 1 FY1 reported that they 'often' received SBAR handovers with 5 'almost always' accepting an instant messaging handover. On average, FY1 doctors were only sometimes provided with all three patient identifiers (mean 3.3)

Less than 15% of all FY1 doctors used a structured handover sheet to document the jobs generated (mean 3.4), and only 20% of FY1s would "almost always" give this same list to the night team (mean 3.7). Despite 100% strongly agreeing that the quality of evening handover affected the night (mean 5), the current handover mechanism would suggest that continuity of care is leading to repetitions and incomplete handover such that only 5 doctors felt "almost always" able to comfortably communicate jobs they had been unable to complete, to the night team (mean 3.7). Sometimes, FY1 doctors received all three patient identifiers (mean =3.3) and there were occasional instances were tasks could not be

completed because of misidentification.

It was found that 80% strongly agreed that the handover process should be standardised using a proforma (handover sheet), especially as all doctors reported that they were pushed for time (mean 3.3) and distracted when taking handovers (mean 3.1). This would go on to be the focus of our improvement project.

#### PDSA 2: Baseline Analysis:

Prior to the implementation of the on-call proforma, we analysed the current recording of information during a week of evening on-call shifts, against RCP standards for documentation.

There was a marked variability in documentation, with all 5 handover sheets recorded on sheets of paper, with a variable organisation of information.



Figure 1: Process mapping – this process focussed on downstream solutions

Mixed data collection was observed and key parameters were not being documented: only 8% of all jobs had all three patient identifiers with S.B.A.R documented in less than half of all jobs.<sup>3</sup> Importantly, 8% of all jobs audited were not completed. This is as a direct consequence of poor patient identification, with incorrect patient identifiers, failing to record the patient location meaning that the job could not be followed up or no patient background to contextualise and adequately respond to the job.

Contextualisation of an ideal handover process aimed to focus improvement on the downstream handover process, whereby the FY1 doctor receives and documents the handover. This was chosen because this would directly involve a key stake holder (FY1s) and allow suboptimal handover to be signalled by the receiving FY1 doctor who could then prompt out-going medical teams to follow a standard system of communication. The FY1 would be guided by a new handover proforma, written to be aligned to the ideal order of proceedings for our local centre. Columns were created for bleep number, location (ward and bed number), patient identifiers, including name, hospital number and date of birth, background (incorporating SBAR) and reason for handover. This form was made compliant with the Academy of Medical Royal Colleges (AoMRC) national standards.<sup>6</sup>



Figure 2: Pre-intervention handover outcomes

#### PDSA 3: Intervention – On-Call Proforma:

Wexham Park Hospital: Out of hours handover Date: \_\_\_\_ Name: \_\_\_\_\_

Bleep	Ward, Bed No.	Patient Identifiers (Name, DOB, Hospital number)	Background (S.B.A.R )	Reason for handover	Clinical Priority?



Introduction of a structured handover sheet resulted in 100% completion of all jobs being handed over by increasing the quality of information documented. Inclusion of all three patient parameters rose from 8.4% to 51.8% with the introduction of the new handover sheets and 87% had at least 2 patient identifiers. All jobs handed over had a clear reason for the handover and this led to all jobs being either completed by the evening on-call team, or being passed to the night team.



Figure 4: Comparison of pre and post intervention outcomes

Service Evaluation DAUIN 20180146

#### Discussion

This QIP was generated from anecdotal evidence suggesting that the evening on-call handover process could be improved. The qualitative arm of this project aimed to identify these problems by engaging the key stakeholders (FY1 doctors). The questionnaire revealed widespread problems with variable handover practices including inconsistent documentation leading to inefficiencies, repetition and incomplete jobs, contributing the unsatisfactory handover later that evening.

The handover process was rationalised into an algorithm, and analysed to generate a downstream improvement recommendation to bring in a proforma with the aim of standardising the handover process. Focussing on the receiving end of the handover process ensures that the onus is on the on-call doctor to record correct information. The order to the sheet ensures the handover process flows as per the typical handover conversation with bleep number, location, patient identifiers, background (SBAR), and reason for handover to mirror the ideal handover process. Where there are deviations from this, the on-call doctor can prompt the referrer as per the headings on the handover sheet.

To test the fidelity and feasibility of the intervention, the baseline audit demonstrated that handover is highly variable, with different communication strategies used. Box method was the preferred medium of documenting accumulated jobs. Auditing the quality of information based on RCP handover standards led to the conclusion that best practice standards were not being followed. Specifically, incomplete patient identifiers, absent past medical histories and inchoate locations strengthened the argument in favour of the need for a structured handover sheet, connected to the outcomes of improving quality of written information.

The implementation of the handover sheets into a previously unstructured system, not only improved patient safety, by preventing misidentification and clearly identifying the patient location, it also gave more relevant patient background to assist the on-call team in handing over outstanding jobs to the night team. Furthermore, a box for clinical priority crudely stratifies jobs based on clinical urgency and is a further safeguard for patient safety when prioritising jobs.

The handover process is strengthened by introducing an "on-call" pro-forma, allowing clearer documentation of patient identifiers, past history, jobs and clinical priority, facilitating clear baton passing and providing a further safeguard for patient safety. This intervention is cost effective, easy to implement and standardises the system of documentation and of order of proceedings and tied to the local unit and needs.

#### Limitations

This Quality Improvement Project touches on a small piece of the grander handover conundrum. We have focused on a downstream solution and further work would aim to tackle the upstream processes including communication training and engaging doctors who refer patients to the 'on-call' service.

Sustainability of this project will be dependent on maintaining standards, to prevent performance reverting to pre-intervention. Measures to secure this have included uploading the pro-forma onto the internet and incorporating handover into the induction agenda for junior doctors. Ongoing education and training will be essential and will need to cover generic and local requirements, the use of specific terminology, how to prioritise patients and work, training in specific communication techniques and skills, engaging multiple stakeholders and apply to all handover interactions across disciplines and groups.

#### Conclusions

This project demonstrates a potential model of improvement at hospitals which utilises a bleep system of handovers. Specifically, the project found that we are not meeting standards for effective handovers, presenting a patient safety issue as time critical jobs may not have sufficient information to allow for their completion. The handover process is strengthened by introducing an "on-call" pro-forma, allowing clearer documentation of patient identifiers, past history, jobs and clinical priority, facilitating clear baton passing.

This is a sustainable project as further audits have demonstrated that the standards are being maintained. Key stakeholders have been engaged by delivering focussed teaching sessions to the new incoming FY1 doctors, and with the intervention now available on the local intranet, this downstream improvement has anecdotally improved satisfaction with the handover process and objectively improved the quality of information communicated and documented.

Further work would focus on introducing this intervention to other departments within the hospital with the end aim of developing Trust wide guidelines to formally embed evening on-call handover into hospital policy and culture. Moreover, more work could be done to identify upstream solutions to create improvement recommendations such as a communication

workshop. This would align with national guidelines, which call for training in specific communication techniques and skills.<sup>1, 3, 4</sup>

#### References

- 1. Royal College of Physicians. Acute Care Toolkit 1:Handover. London. May 2011
- 2. British Medical Association. Safe handover: safe patients. Guidance for clinical handover for clinicians and managers. London: BMA. 2004.
- Dr M Leonard et al. SBAR (Situation, B a c k g r o u n d , A s s e s s m e n t , Recommendation).Kaiser Permanente, Colorado, USA. Taken from the NHS Institute

for Innovation and Improvement website. Available from URL:

- General Medical Council. Domain 1: Knowledge skills and performance. [online] Available at: https://www.gmc-uk.org/ethicalguidance/ethical-guidance-for-doctors/goodmedical-practice/domain-1---knowledge-skillsand-performance#paragraph-14 [Accessed 28 May 2018].
- 5. Raduma-Tomàs MA, Flin R, Yule S, Williams D. Doctors' handovers in hospitals: a literature review. BMJ Qual Saf. 2011;20:128-133.
- 6. Academy of Medical Royal Colleges. A clinician's guide to record standards parts 1 and 2. London: AoMRC, 2008.

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### Ectopic Pregnancy and Levonorgestrel - Only Emergency Contraception: A Systematic Review

Shurie S, Lwande G

Institution Moi University, Usain Gishu County, Academic Highway, Eldoret, Kenya

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#### Abstract

**Background**: This study aimed at evaluating previously done studies on the proportion of ectopic pregnancies among women with a history of emergency contraception failure.

Data was obtained from PubMed, Google Scholar and the Cochrane Database of Systematic Reviews.

**Methods of Study Selection**: This study included data from 114 studies which followed a defined population of women treated one time with emergency levonorgestrel-only contraceptive pills and whose number and location of pregnancies were ascertained. **Results**: 14.3% (n = 2) of all the studies did not report any incidence of ectopic pregnancy

following levonorgestrel-only emergency contraception. The majority of the reported cases of ectopic pregnancy were from studies done in China. Repeated use of levonorgestrel emergency contraception in the same menstrual cycle increased the risk of ectopic pregnancy.

**Conclusion**: The risk of ectopic pregnancy following emergency contraception failure rises when levonorgestrel only emergency contraception is used repeatedly in the same cycle or close to the ovulation period.

#### Key Words

Ectopic Pregnancy; Extra-uterine Pregnancy; Postcoital Contraception; Levonorgestrel.

#### **Corresponding Author:**

Dr Sahara Shurie; E-mail: omar.sahash@gmail.com

#### Introduction

#### Rationale

Ectopic pregnancy is the implantation of the blastocyst anywhere other than the endometrial lining of the uterine cavity<sup>1</sup>. Extra-uterine pregnancy has been shown to increase the risk of mortality than vaginal delivery or induced abortion<sup>2</sup>. Approximately 90% of ectopic pregnancies occur within the tubes<sup>3</sup>. Other sites of ectopic pregnancy include the ovary, abdominal cavity, intrauterine portion of the fallopian tube (corneal pregnancy)<sup>4,5</sup>. The proportion of ectopic pregnancy is 1 in 150 pregnancies<sup>6</sup>. Ovarian pregnancy may occur as a result of rare fertilization and trapping of the ovum within the follicle just at the time of the rapture while abdominal pregnancy could result from the fertilized ovum dropping out of the fimbriated end of the tube<sup>7</sup>. In all these, the fertilized ovum undergoes its usual development with the formation of placental tissue, amniotic sac and fetus while the host implantation site develops decidual changes<sup>8</sup>.

The four major factors that predispose a woman to ectopic pregnancy are classified as mechanical and functional factors, assisted reproduction and failed contraception. This paper will major on failed contraception; especially emergency contraception. Levonorgestrel–only emergency contraception (LOEC) treatment failure has been attributed to ectopic pregnancy<sup>2</sup>.

#### **Objectives**

To review mixed clinical studies among women aged between 18 to 45 years receiving either 0.75mg (double dose), 1.5mg (single dose) of levonorgestrel only emergency contraception.

To compare studies on women using LOEC versus those with no form of family planning.

To assess how many studies among women using LOEC had ectopic pregnancy as the outcome of interest.

#### Methodology

#### **Eligibility Criteria**

Clinical studies adopting randomized double-blind and case-studies case-control study design were selected for this review. The literature, which included women of fertile age, compared one and/ or two doses of levonorgestrel taken in different regimens. Reasons for exclusion included non-English studies, literatures involving non-human models, studies which compared levonorgestrel with other emergency hormonal contraceptives and publications concerned with dosage forms other than oral tablets.

#### Information Sources

PubMed, Google Scholar and Mendeley databases were searched from 2000-2017 using the key terms: emergency contraception, postcoital contraceptives and levonorgestrel-only emergency contraception.

#### Search

Studies were checked for duplicates and relevance for review by looking at title and abstracts. Where it was not possible to exclude publications by reviewing the title or abstract, the full paper was retrieved and reviewed.

#### Study Selection

Decisions for trials to be included were independently made by two reviewers. The references of the retrieved studies were searched for further studies. The selected studies were assessed for use of levonorgestrel only emergency contraception and the occurrence of ectopic pregnancy as an outcome.

#### **Data Collection Process**

The data collected was keyed into a data collection table containing: the authors, country where the study was conducted, the population characteristics such as age range, study title, design and outcome (whether or not ectopic pregnancy was reported).

#### Data Items

The first two authors independently reviewed the search results for studies of clinical trials or casecontrol study design where levonorgestrel was taken orally for contraception and whether or not there was ectopic pregnancy as an outcome.

#### **Summary Measures**

The principal summary measures were significant associations, risk ratios and mean differences.

#### **Risk of Bias Across Studies**

This was assessed using the Cochrane Collaboration risk of bias assessment tool. RevMan was used to plot the risk of bias. Selection bias was assessed by conducting sequence generation and allocation concealment.

#### **Outcome Measures**

Pregnancy rates, percent of pregnancies prevented, side-effects and occurrence of ectopic pregnancy were assessed as the study outcomes. Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) criteria for reporting systematic reviews of studies was used to evaluate healthcare interventions as a quality appraisal tool.

#### Results

Study Selection: 107 relevant studies (as shown in the study selection flow diagram - Figure 1) were identified through database searches and an additional 35 records were identified. There were 114 records after the duplicates were removed. 114 records were screened and 62 records were excluded, leaving 52 full texts for eligibility assessment of which 14 were included. The excluded, 38 studies had either incomplete information on the drug regimen, number of pregnancies, the duration of data collection or levonorgestrel only compared emergency with other compounds contraceptives and therefore those ten studies were omitted from this review. Discrepancies were resolved by discussion and consultation with other reviewers including clinicians if needed.



Figure 1: PRISMA 2009 Flow Diagram

#### Table 1: Study Characteristics

The occurrence of ectopic pregnancy following emergency contraception failure has been found to occur most commonly in China and parts of South East Asia, Africa and Latin America. In this study, the same pattern was observed.

		Population Charac- teristics		Study Title, Design and Outcome		
Authors (Year)	Country	No. of Subjects	Age (Years)	Study Title and Design	Outcome Ectopic Pregnancy (Yes/No)	
Q.J. Chen, W.P. Xiang, D.K. Zhang, R.P. Wang, Y.F. Luo, J.Z. Kang, & L.N. Cheng (2011)	China	2445	15–48	Efficacy and safety of a levonorgestrel en- teric-coated tablet as an over-the- counter drug for emergency contraception: a Phase IV clinical trial(9).	No	
Suk Wai Ngai, Susan Fan, Shiqin Li, Linan Cheng, Juhong Ding, Xiaoping Jing, Ernest Hung, Yu Ng & Pak Chung Ho1 (2005)	China	2071	27 (mean)	A randomized trial to compare 24 h versus 12 h double dose regimen of levonorgestrel for emergency contracep- tion(10) (Clinical Trial 1997 and 2003)	No	
Hung-Hung Lin1, Ming-Chao Huang, Chen-Ju Lin, Chih-Ping Chen	Taiwan	1	29	Ectopic Pregnancy with oral contraceptive (11)(Case-study; letter to the editor)	Yes	
Kelly Cleland, Elizabeth Raymond, James Trussell, Linan Cheng & Haop- ing Zhu (2010).	China	137 (studies)		Ectopic Pregnancy and Emergency Contra- ceptive Pills: A Systematic Review(12)	Yes	
Pedro Paulo Pereira, Fábio Roberto Cabar, Luciana Cristina Pasquini Raiza, Maria Teresa Roncaglia, and Marcelo Zugaib (2005)	Brazil	2	30.5 (mean)	Emergency Contraception and Ectopic Pregnancy: Report of 2 Cases (13)	Yes	
Zhuomin, Zhang Liju, Weng, Zhiyan, Zhang, Xunxun, Jin Xiaoping, Jing Liying, Zhang, Shizhu, Lian Yibing, Cui (1994)	China	1,420		An epidemiological study on the relation- ship of ectopic pregnancy and the use of contraceptives in Beijing(14).	Yes	
Jian Zhang, Cheng Li, Wei-Hong Zhao, Xiaowei Xi, Shu-Jun Cao, Hua Ping, Guo-Juan Qin, Linan Cheng & He-Feng Huang (2015).	China	7,246		Association between levonorgestrel emer- gency contraception and the risk of ectopic pregnancy: a multicenter case-control study (15)	Yes	
Gabriela Noé, Horacio B.Croxatto, Ana María Salvatierra, Verónica Reyes, Claudio Villarroel, Carla Muñoz, Gabriela Morales,	Chile	388		Contraceptive efficacy of emergency con- traception with levonorgestrel given before or after ovulation (16)	Yes	
Anita Retamales. (2009)				Reduced prevalence of chronic tubal in-		
Wei-Hong Zhao, Mei Zhang, Jian Zhang and Linan Cheng (2015)	China	79	31.94 ± 0.59	flammation in tubal pregnancies after levonorgestrel emergency contraception failure (17)	Yes	
Cheng Li, Wei-Hong Zhao, Qian Zhu, Shu-Jun Cao, Hua Ping, Xiaowei Xi, Guo-Juan Qin, Ming-Xing Yan, Duo Zhang, Jun Qiu and Jian Zhang	China	2411		Risk factors for ectopic pregnancy: a multi- center case-control study (18)	Yes	
Cheng Li, Wei-Hong Zhao, Chun-Xia Meng, Hua Ping, Guo-Juan Qin, Shu- Jun Cao, Xiaowei Xi, Qian Zhu1, Xiao -Cui Li, Jian Zhang (2014)	China	7246		Contraceptive Use and the Risk of Ectopic Pregnancy: A Multi-Center Case-Control Study (19)	Yes	
Duo Zhang, Ming-Xing Yan, Jue Ma, Wei Xia, Rui-Hong Xue, Jing Sun and Jian Zhang (2016)	China	300	20->40	Association between knowledge about levonorgestrel emergency contraception and the risk of ectopic pregnancy following levonorgestrel emergency contraception failure: a comparative survey (20)	Yes	
Jian Zhang, Cheng Li, Wei-Hong Zhao, Xiaowei Xi, Shu-Jun Cao, Hua Ping, Guo-Juan Qin, Linan Cheng & He-Feng Huang (2015)	China	2411		Association between levonorgestrel emer- gency contraception and the risk of ectopic pregnancy: a multicenter case-control study (15)	Yes	
Laura Fabunmi and Nigel Perks (2002)	United Kingdom	1	38	Caesarean section scar ectopic pregnancy following postcoital contraception: Case Study(21)	Yes	

#### Discussion

#### Summary of Evidence:

In this review, 14.3% (n = 2) of all the studies did not report any incidence of ectopic pregnancy following levonorgestrel-only emergency contraception. In a phase IV post-marketing study of a new enteric coated levonorgestrel-only emergency contraceptive (E-LNG ECP) as an over the counter medication in China<sup>9</sup>, it was found that the efficacy rate of E-LNG ECP was 95.3% with a failure rate of only 0.2%. This could be attributed to the fact that majority (82.7%) of all the study participants took their first dose within 24 hours after their unprotected sexual intercourse. Previous studies<sup>22,23</sup> have attributed increased odds of pregnancy following emergency contraception failure by 50% when the first dose is delayed by 12 hours. This study did not find any incidence of ectopic pregnancy as an adverse event. The only complaints reported by 7.1% (n = 165) of all participants were nausea, vaginal bleeding, headache, xerostomia, vomiting, transient chest distress, lower abdominal pain, anorexia, fatigue and dizziness. The study noted a reduced incidence of nausea (4.2%; n = 108) due to the enteric coated nature of the emergency contraceptive pill compared to other randomized controlled trials done on non-enteric coated emergency contraceptive pills<sup>24,25</sup>. A second study conducted in Hong Kong determined that 0.75 mg levonorgestrel given 24 hour apart is as effective as the 12-hour regimen for emergency post-coital contraception up to 120 hour after unprotected intercourse<sup>10</sup>. The authors suggested that the long half-life of levonorgestrel and the resultant maintenance of high plasma concentrations probably explain why the 24 hour dosing interval is also effective<sup>10</sup>. However, the pregnancy rates following emergency contraception failure were 1.9% (95% CI: 1.2-2.9) in the 24-hour regimen, 2.0% (95% CI: 1.2–3.0) in the 12-hour regimen group and 2.7% (P >0.05) in the 72-hour regimen group. These results were consistent with the results among Chinese women in a World Health Organization commissioned study<sup>24</sup>. Further acts of unprotected coitus increased the likelihood of pregnancy significantly (p = 0.003) with an odds ratio of 3.62 (95% CI: 1.49-8.81) in the 12-hour regimen group and odds of 0.88 (95% CI: 0.29-2.65) in the 24hour regimen group.

Although the literature search focused on studies conducted globally, majority of the studies were from Asia. This could be attributed to the great uptake of emergency contraception alongside other contraception options due to the one child policy in

China at the time the studies were being conducted. This does not exclude the fact that in the event of emergency contraception failure or repeat use of emergency contraception in the same cycle increases the likelihood (Adjusted OR [AOR] 2.49, 95%CI: 1.00-6.19) of the subsequent pregnancy being ectopic<sup>15</sup>. In the third Chinese study<sup>15</sup>, it was determined that previous use of LOEC was not correlated with ectopic pregnancy and that LOEC reduced the risk for intrauterine pregnancy (AOR 0.20, 95%CI: 0.14-0.27), but did not increase the risk for ectopic pregnancy (AOR 1.04, 95%CI: 0.76-1.42). The risk of ectopic pregnancy increased among women who further had unprotected sexual intercourse following LOEC use (AOR1 2.35, 95% CI: 1.17–4.71). The authors recommended a better understanding of the risk of ectopic pregnancy following LOEC failure could optimize LOEC use and thus reduce the risk of ectopic pregnancy.

Lastly, the ground breaking study in ectopic pregnancy following LOEC use was a case study in the United Kingdom<sup>21</sup>. This was a multiparous woman who had a failed progestogen-only emergency contraception. Another case study from Brazil<sup>13</sup> reported ectopic pregnancy among two women who had correctly used LOEC following unprotected sexual intercourse. The authors argued that the use of emergency contraception close to the ovulation period lowers the chance of modifying ovulatory function. This could explain higher contraception failure rates observed after use during this period, and could increase the risk of ectopic pregnancy<sup>13</sup>.

#### Limitations:

We could not access all studies on ectopic pregnancy following emergency contraception failure from other countries and jurisdiction.

#### Conclusions:

The risk of ectopic pregnancy following emergency contraception failure rises when levonorgestrel-only emergency contraception is used repeatedly in the same cycle or close to the ovulation period. More awareness campaigns should be conducted to create awareness on the proper method and timing of use. Other long term forms of family planning should be encouraged as potential users are discouraged on using emergency contraception as a routine form of family planning.

#### Funding

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#### References

- Steele BJ, Layman K. Ectopic Pregnancy After Plan B Emergency Contraceptive Use. J Emerg Med [Internet]. 2016 Apr 1 [cited 2018 Aug 8];50(4):663-6. Available from: http:// linkinghub.elsevier.com/retrieve/pii/ S0736467915012718
- 2. Sheffer-Mimouni G, Pauzner D, Maslovitch S, Lessing JB, Gamzu R. Ectopic pregnancies following emergency levonorgestrel contraception. Contraception. 2003;
- 3. Nama V, Manyonda I. Tubal ectopic pregnancy: diagnosis and management. Arch Gynecol Obstet. 2009;279(4):443–53.
- 4. Hailu FG, Yihunie GT, Essa AA, Tsega WK. Advanced abdominal pregnancy, with live fetus and severe preeclampsia, case report. BMC Pregnancy Childbirth [Internet]. 2017 Jul 26 [cited 2018 Aug 20];17(1):243. Available from: http://www.ncbi.nlm.nih.gov/pubmed/28747162
- Yoder N, Tal R, Martin JR. Abdominal ectopic pregnancy after in vitro fertilization and single embryo transfer: A case report and systematic review. Reprod Biol Endocrinol [Internet]. 2016;14(1). Available from: http:// dx.doi.org/10.1186/s12958-016-0201-x
- Schwandt HM, Creanga AA, Danso KA, Adanu RMK, Agbenyega T, Hindin MJ. A comparison of women with induced abortion, spontaneous abortion and ectopic pregnancy in Ghana. Contraception [Internet]. 2011 Jul 1 [cited 2018 Jun 5];84(1):87–93. Available from: http:// www.ncbi.nlm.nih.gov/pubmed/21664516
- Nalaboff KM, Pellerito JS, Ben-Levi E. Imaging the Endometrium: Disease and Normal Variants. RadioGraphics [Internet]. 2001 Nov 1 [cited 2018 Jun 25];21(6):1409–24. Available from: http://pubs.rsna.org/doi/10.1148/ radiographics.21.6.g01nv211409
- Dubinsky TJ, Guerra F, Gormaz G, Maklad N. Fetal survival in abdominal pregnancy: A review of 11 cases. J Clin Ultrasound [Internet]. 1996 Nov [cited 2018 Aug 20];24(9):513–7. Available from: http://www.ncbi.nlm.nih.gov/ pubmed/8906483
- Chen Q-J, Xiang W-P, Zhang D-K, Wang R-P, Luo Y-F, Kang J-Z, et al. Efficacy and safety of a levonorgestrel enteric-coated tablet as an overthe-counter drug for emergency contraception: a Phase IV clinical trial. Hum Reprod [Internet]. 2011 Sep [cited 2018 Jun 26];26(9):2316–21. Available from: http://www.ncbi.nlm.nih.gov/ pubmed/21672924
- Ngai SW, Fan S, Li S, Cheng L, Ding J, Jing X, et al. A randomized trial to compare 24 h versus 12 h double dose regimen of levonorgestrel for emergency contraception. Hum Reprod. 2005;20(1):307–11.

- Lin H-H, Huang M-C, Lin C-J, Chen C-P. Ectopic Pregnancy With Oral Contraceptive Use. Taiwan J Obstet Gynecol [Internet]. 2008 Sep 1 [cited 2018 Jun 6];47(3):341–2. Available from: https://www.sciencedirect.com/science/ article/pii/S1028455908601370
- Cleland K, Raymond E, Trussell J, Cheng L, Zhu H. Ectopic pregnancy and emergency contraceptive pills: a systematic review. Obstet Gynecol [Internet]. 2010 Jun [cited 2018 Aug 8];115(6):1263–6. Available from: http:// www.ncbi.nlm.nih.gov/pubmed/20502299
- Pereira PP, Cabar FR, Raiza LCP, Roncaglia MT, Zugaib M. Emergency contraception and ectopic pregnancy: report of 2 cases. Clinics. 2005;60(6):497–500.
- 14. Zhuomin Z, Liju W, Zhiyan Z, Xunxun J, Xiaoping J, Liying Z, et al. An epidemiological study on the relationship of ectopic pregnancy and the use of contraceptives in Beijing—the incidence of ectopic pregnancy in the Beijing area. Contraception [Internet]. 1994 Sep 1 [cited 2018 Jun 5];50(3):253–62. Available from: http://linkinghub.elsevier.com/retrieve/ pii/001078249490071X
- 15. Zhang J, Li C, Zhao W-H, Xi X, Cao S-J, Ping H, et al. Association between levonorgestrel emergency contraception and the risk of ectopic pregnancy: a multicenter case-control study. Sci Rep [Internet]. 2015 Jul 12 [cited 2018 Jun 5];5(1):8487. Available from: http:// www.nature.com/articles/srep08487
- Noé G, Croxatto HB, Salvatierra AM, Reyes V, Villarroel C, Muñoz C, et al. Contraceptive efficacy of emergency contraception with levonorgestrel given before or after ovulation. Contraception. 2011;84(5):486–92.
- Li C, Meng C-X, Sun L-L, Zhao W-H, Zhang M, Zhang J, et al. Reduced prevalence of chronic tubal inflammation in tubal pregnancies after levonorgestrel emergency contraception failure. Pharmacoepidemiol Drug Saf [Internet]. 2015 May [cited 2018 Jun 26];24(5):548–54. Available from: http://doi.wiley.com/10.1002/pds.3775
- Li C, Zhao W-H, Zhu Q, Cao S-J, Ping H, Xi X, et al. The effectiveness of financial incentives for smoking cessation during pregnancy: is it from being paid or from the extra aid? BMC Pregnancy Childbirth [Internet]. 2012 [cited 2018 Jun 26];12:24. Available from: https:// www.ncbi.nlm.nih.gov/pmc/articles/ PMC4546260/pdf/12884\_2015\_Article\_613.pdf
- 19. Li C, Zhao W-H, Zhu Q, Cao S-J, Ping H, Xi X, et al. Risk factors for ectopic pregnancy: a multi -center case-control study. BMC Pregnancy Childbirth. 2015;15(1):187.
- 20. Zhang D, Yan M-X, Ma J, Xia W, Xue R-H, Sun J, et al. Association between knowledge about levonorgestrel emergency contraception and

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the risk of ectopic pregnancy following levonorgestrel emergency contraception failure: a [Internet]. 2016 [cited 2018 Jun 26];25(8):880-8. Available from: http://www.ncbi.nlm.nih.gov/ pubmed/26748685\

- 21. Fabunmi L, Perks N. Caesarean section scar ectopic pregnancy following postcoital. 2017;28 (3):155-7.
- pregnancy rates of the delay in the administration of levonorgestrel for emergency contraception: a combined analysis of four WHO trials. Contraception [Internet]. 2011 Jul 1 [cited 2018 Jun 5];84(1):35-9. Available from: http:// www.ncbi.nlm.nih.gov/pubmed/21664508
- 23. Piaggio G, von Hertzen H, Grimes DA, Van Look PFA. Timing of emergency contraception with

levonorgestrel or the Yuzpe regimen. Lancet. 1999;353(9154):721.

- comparative survey. Pharmacoepidemiol Drug Saf 24. HERTZEN VH. WHO Research Group on Postovulatory Methods of Fertility Regulation.: Lowdose mifepristone and two regimens of levonorgestrel for emergency contraception: a WHO multicentre randomised trial. Lancet [Internet]. 2002 [cited 2018 Aug 29];360:1803-10. Available from: www.thelancet.com1803
- 22. Piaggio G, Kapp N, von Hertzen H. Effect on 25. Arowojolu A., Okewolea I., Adekunlea A. Comparative evaluation of the effectiveness and safety of two regimens of levonorgestrel for emergency contraception in Nigerians. Contraception [Internet]. 2002 Oct 1 [cited 2018 Aug 29];66(4):269-73. Available from: https:// www.sciencedirect.com/science/article/pii/ S0010782402003372

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### Factors Affecting Treatment Compliance Among Type 2 Diabetes Patients on Follow-Up at Moi Teaching and Referral Hospital

Koech C\*, Nguka G\*\*, Oloo AJ\*\*

#### Institution

#### Abstract

\*Moi University, Usain Gishu County, Academic Highway, Eldoret, Kenya \*\*Masinde Muliro University of Science and Technology, P. O. BOX 190-50100, Kakamega, Kenya

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Best practice in management of chronic diseases such as diabetes, which requires long duration of treatment and multiple therapies, remains a major challenge in primary health care settings worldwide. By the year 2014, global prevalence of diabetes was estimated to be 9% among adults aged eighteen years and above. which is quite a large number, compared to other non-communicable diseases. Diabetes accounted for 2% of deaths in 2010 and it is estimated that the prevalence of diabetes in Kenya is at 3.3% and predicted to rise to 4.5% by 2025. An essential component of evaluating and improving diabetic care is the assessment of factors that affect drug compliance standards and quality of care. Factors such as internal/external environment, healthcare system factors and factors related to medication use system are believed to affect or cause changes in the way patients take their medicine. It is in this context that this study will be conducted. The main objective is to document the factors affecting treatment compliance for diabetic patients in Moi Teaching and Referral Hospital, Eldoret Kenya. A descriptive crosssectional study design was used in which data was collected. Data collection tools included a structured questionnaire with Morisky's eight question instrument. A total of 139 diabetic patients were requested to participate in the study, where questionnaires were given out to those willing by a trained research assistant, after which data was entered, cleaned and analyzed using Statistical Package for Social Sciences (SPSS) version 21.0. Univariate analysis was used to summarize data, describe social demographic characteristics of study respondents and determine level of adherence. Bivariate and multivariate analysis models were used to examine the relationships among the various independent factors.

#### Key Words

Adherence; Compliance; Diabetes Mellitus; Factors and Treatment

#### **Corresponding Author:**

Mr Caleb Koech; E-mail: calebkoech07@gmail.com

#### Introduction

#### 1.1. Background of the Study

Diabetes type 2 occurs when the body doesn't produce enough insulin to function properly, or the body's cells don't react to insulin. This means that glucose stays in the blood and isn't used as fuel for energy. By the year 2014, global prevalence of diabetes was estimated to be 9% among adults aged 18 years and above<sup>1</sup>.

Internationally in 2012, an estimated 1.5 million deaths were directly caused by diabetes. More than 80% of diabetes deaths occur in low- and middle-income countries. WHO projects that diabetes will be the 7th leading cause of death in 2030.

The incidence of diabetes, especially type 2, is rapidly growing in the world. In 1985, an estimated 30 million people suffered with this chronic disease,

which, by the end of 2006, had increased to 230 million, representing 6% of the world population. Of this number, 80% are found in the developing world. It is estimated that, during the next 35 years, diabetic world-wide prevalence will reach 25%, with India being the hardest hit. For a long time, Africa was considered safe from many of the diseases that are called "diseases of affluence," which plague the Western world.

Similarly, there was a time when Africa was thought to be a continent, relatively free of diabetes mellitus. Today, however, diabetes is very common in Africa, a situation that seemed to have remained virtually static until the 1990s and more recently. From 1959 to the mid-1980s, medical statistics showed that the prevalence rate of diabetes in Africa was equal to or less than 1.4%, with the exception of South Africa, where the rate was estimated to be as high as 3.6% in 2001.

In Kenya, diabetes accounted for 2% of deaths in 2010 and it is estimated that the prevalence of diabetes in Kenya is at 3.3% and predicted to rise to 4.5% by 2025. (WHO, 2010)

Most studies on diabetes have taken place in Kenya's teaching and national referral hospitals: Moi Teaching and Referral Hospital in Eldoret and Kenyatta National Hospital (KNH) in Nairobi<sup>2</sup>. These studies have focused mainly on the complications of diabetes. As the Ministry of Health devolves the management, planning and implementation of health policy to the districts, the need for rural health facility-based research has become a necessity to guide health policy at the local level.

Management of diabetes mellitus and its complications presents an increasing challenge to healthcare systems throughout the world, although substantial resources have been invested in diabetes mellitus in several developed and developing countries<sup>3</sup>. Diabetes management and outcomes remain unsatisfactory and Kenya, as a developing country, is not an exception.

Studies have been conducted in various countries and have been used in various clinical settings, the results of which have identified inappropriate drug therapy and gaps in adherence to clinical guidelines<sup>4</sup>. There is uncertainty, however, regarding the extent to which these guidelines are adhered to. With the devolution of Kenya's Ministry of Health (MOH), there should be clear guidelines on standards of diabetes care in the delivery of health services and the interventions need to be laid down according to evidence-based guidelines and best practices to improve outcomes of diabetic patients. This study will identify both met and unmet standards in diabetes care.

Diabetes Mellitus (DM) is a widespread disease which has affected both young and old worldwide and is a major cause of morbidity and mortality.

According to previous studies from the literature, polypharmacy (prescription of several drugs to be used by a patient at ago) is associated with a higher cost, increased risk of side effects, drug interactions and non-compliance<sup>5</sup>. There is no existing data on treatment compliance in management of diabetes mellitus in Kenya. However, a study in the neighboring Eastern Uganda indicates that about four in five patients adhere to anti-diabetic treatment<sup>6</sup>. Strategies aimed at improving anti diabetic drug availability and providing health education could improve adherence.

This study aims to provide information concerning

compliance to anti-diabetic drugs which may be useful to policy makers in development of protocols governing prescribing, patient education, and ways to eliminate the factors hindering drug compliance for diabetes patients.

#### Methodology

This was a descriptive cross-sectional study. Information on both the independent and dependent variables were collected at the same point in time after approval by the Institutional Review Board.

The study was conducted at Moi Teaching and Referral Hospital; a government run hospital that is located 310 km North West of Nairobi in Uasin Gishu County (Eldoret). A number of specialist clinics are run at the hospital and the diabetes outpatient clinic is one of these clinics. Average number of patients seen per clinic day is 16: that is on Tuesdays, Thursdays and Friday. This brings to a total of 192 patients per month.

This study area was chosen because the majority of patients in this region come to seek medical care here because of the available facilities and the advantage of serving the neighboring counties. All patients with a diagnosis of diabetes type 2 who presented at Moi Teaching and Referral Hospital diabetic clinic during the period of study constituted the study population.

Sample size calculations were made based on the following formula<sup>7</sup>:

 $n = Z^2 p (1-p)/e^2$ 

Whereby n = the required minimum sample size

e = margin of error (5%)

p = estimated proportion of compliance 9% at MTRH- Eldoret

z = standard normal deviate corresponding to 95% confidence level=1.96

Considering a margin of error of 5% and a 95% confidence level, then the minimum required sample size will be 139.

Convenience sampling procedure was used to select patients attending the Diabetic clinic from 8:00am through 5:00pm on Monday, Thursday and Friday for the period of study. These patients who met the criteria and were eligible for inclusion in the sampling list for the study until such a time that the required sample has been collected.

Data was collected by the researcher and one assistant trained in data instrument. A questionnaire consisting of closed ended questions was used during the interviews. Morisky's eight question instrument was used. The structured data collection instrument information regarding patient's social

demographic characteristics was used. The estimated time used to complete one form is approximately 20 minutes; data was collected within a period of one month at MTRH diabetic clinic during clinic days.

The structured questionnaire containing the Morisky Adherence Predictor Scale (MAPS) was utilized to collect information necessary to assess medication adherence. The questionnaire has three parts. Part I collected information on basic sociodemographic variables. Part II consisted of questions required to gather information on factors affecting antidiabetic treatment compliance. Part III was the eight question Morisky scale which was used to assess the levels of antidiabetic medication adherence. Data was disseminated through illustrations, graphs and figures; electronic and web-based tools; and oral presentations at community, hospital meetings and scientific conferences.

The raw data was cleaned to ensure completeness, consistency and checked for normality and coded. After entry into a data base, SPSS was used to analyze the data. Descriptive statistics i.e., mean, mode, median, range, standard deviation and frequency distributions were used to summarize the data. Univariate analysis was used to summarize data, describe social demographic characteristics of study respondents and determine level of adherence. Bivariate and multivariate analysis models were used to examine the relationships among the various independent factors.

S. No	Objective	Statistical Tool	Scales of Measurement	Output
1	To determine the mean effect of factors on anti diabetic drug compliance	ANOVA	Ordinal	Mean table, mode, variance Degree of freedom
2	To establish the association between the factors and the frequency of hospital admis- sion and occurrence of com- plications	Chi Square	Nominal scale	Levels of chi square
3	To establish the association between the factors, compli- ance and frequency of hospi- tal admissions and frequency of complications	Chi Square	Nominal scale	Values of chi square

#### Table 1: Measurement of Variables

#### Results

This chapter has presented the findings based on the study objectives. A total of 139 respondents participated in the study, representing 100% of the sample size. Thus 'n' for the study was 139.

From the table below, it can be deduced that the majority 52 (37 %) of the respondents were aged between 40-49 years, whereas the lowest 16 (12 %) were between 18-24 years. A higher number 80 (58%) of the respondents were female, while a lower number 59 (42%) were male. The prevalence of type 2 diabetes was high 95 (68%) among married

respondents, whereas it was low 4 (3%) among those who had divorced. The period suffered by the respondents was high 44 (32%) between 1-2 years and low 9 (7%) above 10 years. The study also established that most 63(43%) of the respondent had diploma level of qualification while the least 1 (1%) was a master's degree. The respondents who were employed were the majority 60 (43%) while the lowest 36 (27%) were unemployed. The findings further indicated that the respondents who had a monthly income of 10,000-50,000 were highest, whereas the lowest 12 (9%) had over 50,000. An Official Publication of the Education and Research Division of Doctors Academy

Variable	Highest	Frequency/%	Lowest	Frequency/%
Age in years	40-49 years	52 (37%)	18-24 years	16 (12%)
Gender	Female	80 (58%)	Male	59 (42%)
Marital status	Married	95 (68%)	Divorced	4 (3%)
Period of diabetes type 2	1-2 years	44 (32%)	Above 10 years	9 (7%)
Highest educational qualification	Diploma	63 (48%)	Masters' degree	1 (1%)
Occupation	Employed	60 (43%)	Unemployed	36 (27%)
Monthly income	10000 -50000	51 (38%)	Over 50000	12 (9%)

Table 2: Socio-demographics

### Use of Medicine

Majority 64 (46%) of the respondents indicated that they used pills, followed by both pills and injection that is 50 (36%), and injections 25 (18%) in that order as illustrated in the chart below:



Figure 1: Use of medicine

The study recorded a mean glycated haemoglobin level of 8.3+3.045 with a minimum value of 3 and a maximum of 20.

## Influence of External Environment on Treatment Compliance

From the table below, 71 (51%) of the respondents were in agreement that they were encouraged by family members to take medicine, while 8 (6%) disagreed. On the effect of work, home or hospital

environmental settings on drug compliance most 59 (42%) of disagreed, followed by agree 44 (32%), whereas 6 (4%) strongly disagreed. Lack of money can cause non-compliance to medication was recorded high in 62 (45%) of the respondents while those who strongly disagreed were observed in 4 (3%) of the respondents attending the clinic.

Table	3.	Socio-demographics
Table	э.	Jocio-acmographics

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
I get encouraged by family members to take medicine	58 (42%)	71 (51%)	2 (1.4%)	8 (6%)	0
Work/ home/ hospital environmental settings affect my drug compliance	8 (6%)	44 (32%)	22 (15.8%)	59 (42%)	6 (4%)
Lack of money can cause non compliance to medication	62 (45%)	55(40%)	2 (1%)	16 (12%)	4 (3%)

# Influence of the Healthcare System on Compliance

The study results depicts that majority 75 (54%) of the respondents disagreed that accessibility to the hospital affects drug compliance negatively, followed by 36 (26%) who agreed, whereas the lowest 7 (5%) of the respondents neither agreed nor disagreed. Long waiting time at the hospital affected compliance negatively where 67 (48%) of the respondents were in agreement whereas 5 (4%) neither agreed nor disagreed. The study also indicated that 64 (47%) of the respondents agreed that difficulties in getting a physician affected the respondent's compliance negatively, while 10 (7%) neither agreed nor disagreed. However, 65 (47%) of respondents disagreed that unsatisfied clinic visits affected treatment compliance negatively while 8% was cited both in strongly agree and disagree. This is demonstrated in the table below:

Table 4: Influence of the healthcare system on compliance

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Accessibility to the hospital affects drug compliance negatively	12(9%)	36(26%)	7 (5%)	75(54%)	9 (7%)
Long waiting time at the hospital affects my compliance negatively	26(19%)	67(48%)	5 (4%)	32(23%)	9 (7%)
Difficulties in getting a physician af- fects my compliance negatively	11 (8%)	40(29.2%)	10(7%)	64(47%)	12(9%)
Unsatisfied clinic visits affects treat- ment compliance negatively	8 (6%)	48 (35%)	10(7%)	65(47%)	8 (6%)

# Influence of Internal Environment on Compliance

During the study, 90 (65%) of the respondents disagreed that age affected treatment compliance negatively whereas 4 (3%) neither agreed nor disagreed. About 76 (55%) of the respondents disagreed that level of education influenced

compliance to treatment positively. In addition, 60 (43%) disagreed that attitude and beliefs negatively influenced treatment compliance. The study also recorded 71 (51%) of the respondents disagreed that marital status can influenced treatment compliance positively, as illustrated in the table below:

	Strongly agree	Agree	Neither agree nor	Disagree	Strongly disagree
My age affects treatment compliance	13 (9%)	10 (7%)	4 (3%)	90 (65%)	22 (16%)
My level of education influences compli- ance to treatment positively	12 (9%)	25 (18%)	22 (16%)	76 (55%)	4 (3%)
My attitude and beliefs can negatively influence treatment compliance	22 (16%)	34 (25%)	16 (12%)	60 (43%)	7 (5%)
My marital status can influence treat- ment compliance positively	18 (13%)	30 (22%)	12 (9%)	71 (51%)	7 (5%)

### Table 5: Influence of internal environment on compliance

## Summary of Medication Adherence (Morisky's Eight Question Instrument)

From the table below, high adherence to medication was recorded in 93 (67%) of the respondents who said that they did not forget to take medicine, while low adherence was witnessed in 46 (33%) who forgot to take medicine. About 122 (88%) of the respondents recorded that people sometimes miss taking medicine other than forgetting while 17 (12%) disagreed. Hence there was low adherence among patients in missing to take medicine. From the table below, low adherence to medication was recorded in 103 (74%) of the respondents who agreed that there were days they failed to take medicine, whereas high adherence was seen in 36 (26%) who mentioned that they did not miss taking medicine. High adherence to medication was observed in 124 (88%) of the respondents who indicated that they did not stop taking medicine after feeling bad without consulting their doctor as opposed to 15 (11%) who agreed that they did not consult while 1 (1%) neither agreed nor disagreed. The study results revealed that 110 (79%) of the respondents adhered to medication by not forgetting their medicine when leaving home, followed by low adherence of 28 (20%) indicated that they forgot their medicine when leaving home while 1 (1%) neither agreed nor disagreed. The study recorded high adherence rate 133 (96%) among respondents, who took medicine the previous day, 5 (3%) mentioned that they didn't take their medicine while 1 (1%) neither agreed nor disagreed. The findings of the study indicated low adherence rate of 86 (63%) were recorded on the respondents who disagreed that they stopped taking medicine when the felt like the symptoms were under control, 48 (34%) agreed while 4 (3%) neither agreed nor disagreed. The study indicated high adherence rate of 74 (53%) among respondents who didn't feel hassling about sticking to their treatment plans when taking medication, followed by 64 (46%) who agreed while 1 (1%) was undecided.

Indicator	High adherence	Medium adherence	Low adherence
Forgetting to take medicine	93 (67%)	0	46 (33%)
People sometimes miss taking their medicine other than forgetting	17 (12%)	0	122 (88%)
Thinking over the past two weeks, if there were any days you did not take medicine	36 (26%)	0	103 (74%)
Failure to take medicine without telling your doctor because you felt worse when you took it	124 (89%)	1 (1%)	14 (10%)
Taking medicine the previous day	132 (95%)	1 (1%)	5 (4%)
Stopped taking medicine when feeling like symp- toms are under control	86 (62%)	4 (3%)	48 (35%)
Feeling hassled about sticking to your treatment plan when taking medicine daily	74 (53%)	1 (1%)	64 (46%)

**Table 6**: Medication adherence measurement (Morisky's eight question instrument)

#### Summary of Independent Testing

## Effects of Medication System on Treatment Compliance

The study revealed that the route of administration of antidiabetics influenced treatment compliance negatively correlated with the following; medication side effects affecting compliance to treatment negatively, duration of treatment to influence compliance negatively and treatment complexity affected the compliance negatively, that is, at 0.00 (2 -tailed). Medication side effects affected compliance to treatment negatively which correlated with; duration of treatment to influence compliance negatively and treatment complexity affecting the compliance negatively, that is, at 0.00 (2-tailed). Duration of treatment can influence compliance negatively correlated with; my medication side effects affected compliance to treatment negatively, that is, 0.00 (2-tailed).

Association between negative influence of attitude and beliefs on treatment and when travelling or leaving home do you sometimes forget to bring along your medicine

Chi-square results indicates that the negative influence of attitude and beliefs on treatment was strongly associated with forgetting to bring medicine when travelling or leaving home, that is,  $\chi 2 = 26.291$ , df = 4, p<0.000.

Encouragement by family members and forgetting to bring medicine when travelling or leaving home ANOVA results revealed a relationship between encouragement by family members and forgetting to bring medicine when travelling or leaving home, thus, F=7.305, df = 3, p<0.000.

#### Discussion

Levitt et al, (2000) observed that there is evidence that complications resulting from late diagnosis, late presentation, lack of access to essential medications and services, and poor management of diabetes are common and combine to create a heavy socioeconomic burden for Africa<sup>8</sup>. A recent study suggested that direct costs such as medical care and treatment of diabetes are usually met by the patients, family and health sector. This study shows that 64 (465) of the respondents indicated that they used pills whereas 25 (18%) used injections.

In a study done by Haynes et al, (2002), adherence of 36% was seen when a person is prescribed an antibiotic to be taken as one tablet four times a day for a week for an infection, but takes only two tablets a day for five days<sup>9</sup>. This disagreed with my findings where 93 (67%) of the respondents said that they did not forget to take medicine.

According to the WHO (2003), non-compliance with long-term medication for conditions such as hypertension, dyslipidemia and diabetes is a common problem that leads to compromised health benefits and serious economic consequences in terms of wasted time, money and uncured disease. Contrary, there results indicates that medication side effects affected compliance to treatment negatively which correlated with; duration of treatment to influence compliance negatively and treatment complexity affecting the compliance negatively, that is, at 0.00 (2-tailed).

Health care system factors that affect treatment include; lack of accessibility, long waiting time, difficulty in getting prescriptions filled and unhappy clinic visits.

However, the findings revealed 75 (54%) of the respondents agreed that inaccessibility to the hospital affects drug compliance negatively. Long waiting time at the hospital affected compliance negatively, where 67 (48%) of the respondents were in agreement. The study also indicated that 64 (47%) of the respondents agreed that difficulties in getting a physician affected their compliance to treatment.

Glanz et al, (2002) indicated that internal factors including age, genetics, physical, spiritual, cognition, attitude and personality can influence a patient to have an urge to take medicine or to comply with treatment<sup>10</sup>. However, during the study, 90 (65%) of the respondents agreed that age affected treatment compliance negatively whereas 4 (3%) neither agreed nor disagreed. About 76 (55%) of the respondents agreed that level of education influenced compliance to treatment positively. In addition, 60 (43%) agreed that attitude and beliefs negatively influenced treatment compliance. The study also recorded 71 (51%) of the respondents agreed that marital status can influence treatment compliance positively.

#### Conclusions

Negative influence of attitude and beliefs on treatment was strongly associated with forgetting to carry medicine when travelling or leaving home.

There is a relationship between encouragement by family members and forgetting to carry medicine when travelling or leaving home.

#### Recommendation

National government, county hospitals, relatives and family members should put in place mechanisms to encourage diabetes type 2 patients to take drugs and have the patients fully understand the

detrimental health effects of skipping drugs and cost of treating complications among other losses.

#### References

- WHO. Diabetes fact sheet No. 312. Geneva, Switzerland URL: http://www who int/ mediacentre/factsheets/fs312/en/index html [accessed 2013-02-12][WebCite Cache ID 6ENYIOJ6e]. 2014.
- 2. Chege MP. Risk factors for type 2 diabetes mellitus among patients attending a rural Kenyan hospital. African journal of primary health care & family medicine. 2010;2(1).
- Fitzsimons B, Wilton L, Lamont T, McCulloch L, Boyce J. The Audit Commission review of diabetes services in England and Wales, 1998– 2001. Diabetic Medicine. 2002;19:73-8.
- Elliott RA, Barber N, Clifford S, Horne R, Hartley E. The cost effectiveness of a telephone -based pharmacy advisory service to improve adherence to newly prescribed medicines. Pharmacy World & Science. 2008;30(1):17-23.
- Bailey C, Kodack M. Patient adherence to medication requirements for therapy of type 2 diabetes. International journal of clinical practice. 2011;65(3):314-22.
- 6. Kalyango JN, Owino E, Nambuya AP. Nonadherence to diabetes treatment at Mulago Hospital in Uganda: prevalence and associated factors. African health sciences. 2008;8(2).
- 7. Kirkwood BR, Sterne JA. Essential medical statistics: John Wiley & Sons; 2010.
- Levitt N, Unwin N, Bradshaw D, Kitange H, Mbanya JC, Mollentze W, et al. Application of the new ADA criteria for the diagnosis of diabetes to population studies in sub-Saharan Africa. Diabetic medicine. 2000;17(5):381-5.
- 9. Haynes RB, McDonald HP, Garg AX. Helping patients follow prescribed treatment: clinical applications. Jama. 2002;288(22):2880-3.
- 10. Glanz K, Rimer BK, Viswanath K. Health behavior and health education: theory, research and practice: Jossey-Bass San Francisco; 2004.

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# Tablet Personal Computer Use by MedicalStudents in China: A Quantitative Study

Li J, Mukherjee A, Wang Q

#### Institution

West China Medical School, Sichuan University, 37 Guoxue Lane, Wuhou District 610041, Chengdu, Sichuan, China

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#### Abstract

**Background**: Few studies investigated tablet personal computer (PC) usage by medical students in China. This study determined how medical students were currently using tablet PC and applications (apps), and their attitudes towards using tablet PC and apps in China. **Methods**: A self-administered questionnaire was adopted for data collection from 300 third-year medical students at West China Medical School of Sichuan University in China. Data was analyzed using SPSS 15.0.

**Results**: 283 of the 300 respondents owned a tablet PC, of which 249 possessed an iPad, and 189 made the purchase for both academic and non-academic-related purposes. 67.1% of students used tablet PC mostly for non-academic related purposes in class, and 59.9% of students used tablet PC when they found the lecture unattractive. 61.9% of students admitted that using tablet PC in class was distracting. Most respondents, however, were still positive towards the use of tablet PC in class. Academic-related apps were widely used by respondents, of whom only 11.9% were willing to pay for academic-related apps.

**Conclusions**: Our study suggests widespread tablet PC usage amongst third year medical students in China, with most medical students being positive towards tablet PC use, even though non-class related use and distraction were high in class. Thus, adaptive strategies and proper guidance by medical schools and faculty members are needed urgently to minimize drawbacks, and to use beneficial aspects of tablet PC.

#### Key Words

Medical Education; Tablet Personal Computer; Media in Education

#### **Corresponding Author:**

Dr Qin Wang ; E-mail: wq3166@163.com

#### Introduction

Information technology is continually revolutionizing modern education<sup>1</sup>. Electronic devices, such as personal computers (PC), personal digital assistants, smart phones, and tablet PC, have been widely adopted by the faculty and students<sup>2</sup>. These provide quick and easy access to online educational resources, geographical and temporal flexibility, and personalized learning. According to studies<sup>3,4</sup>, the implementation of PC and PDA has shown to enrich student learning and to increase their performance. A new chapter in the field of modern education started in 2010 and 2011 with the launch of iPad and Android tablets, which in spite of being small, are powerful in functions, portable, wireless and versatile in data entry. In addition, many smart applications (App) available on tablet PC ease our access to information. Being empowered with such benefits, tablet PC has guickly gained popularity among students, especially after 2010; replacing laptops, textbooks, and notebooks in classrooms, especially in college.

Tablet PCs are being widely used in medical education. A recent study showed that 86% of radiology residents used iPad daily when they were provided with an iPad<sup>5</sup>. Reputed Medical schools, such as Stanford University and University of Minnesota, have adopted iPads in their medical curricula<sup>6</sup>. Tablet PCs are not only gaining popularity in developed countries like the United States, but also in developing countries like China. Even though the use of traditional PC and other electronic devices in medical education have been extensively studied, only a few studies have been carried out to investigate the use of tablet PCs by medical students in advanced countries<sup>5,7,8</sup>, and almost none in China. In this study, we aimed to determine how medical students are currently using tablet PC devices and apps in and out of class and their attitudes towards using tablet PC and apps in medical education at a medical school in China.

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Figure 1: Type of usage for tablet PCs by respondents



Figure 2: Purposes of tablet PC use in class.

(A) Type of usage of tablet PCs for academic-related purposes in class for medical students. (B) Type of usage of tablet PCs for nonacademic-related purposes in class for medical students.



Figure 3: Types of Apps used by medical students for academic-related purposes

#### Material and Methods

A self-administered questionnaire in Chinese was developed for data collection after a review of literature. Twelve items were included in the questionnaire regarding the current use of tablet PC and apps, motivations to buy a tablet PC device, attitude towards tablet PCs use in medical education, and study-related apps. Items were all close-end questions including dichotomous choice (yes/no), single-best response questions, and multiple response items. Information on the purpose of this study was revealed to all participants. Convenience sampling was used; questionnaires were distributed to 300 third-year medical students (a stage before internship in hospital) from 2013 to 2014 at West China Medical School of Sichuan University, located in an economically developed area in China. Tablet PC use is neither encouraged nor banned in the classes of this medical school and are not essential for any course. Anonymous responses were collected and all 300 questionnaires were completed and returned with a response rate of 100%. Answers were extracted from questionnaires and double entry was performed to validate the data by two investigators independently.

SPSS 15.0 (SPSS Inc., Chicago, IL) was applied to do the data analysis. The frequency of each response was depicted and percentage was calculated. Continuous data was presented as mean ± standard deviation (SD). Only students with tablet PCs were included in the data analysis except for mean age and proportion of students who owned tablet PCs.

Results

The mean age of all the respondents was 21.4±1.6 years old. The survey showed that 283 of the 300 respondents (94.3%) currently owned a tablet PC: 249 of 283 (88.1%) tablet PC owners possessed an iPad; 27 (9.5%) used Android models and the other 7 (2.4%) participants used devices running on Windows system. 76.2% of tablet PCs were purchased with financial support from parents. Of all the students who have a tablet PC, the main motivation to make the purchase just for learning was found in 88 (31.0%), while for both learning and entertainment were 189 (66.7%), of all the students who have a tablet PC. Interestingly, the remaining 6 (2.3%) students claimed that the main reason they bought a tablet PC was to "follow the crowd and get what everyone has to fit in".

Generally, tablet PCs are often used for learningrelated resource searching, electronic resource reading, entertainment, language assistance and email access (Fig 1). We explored the purposes of tablet PC use in class (Fig 2). For academic purposes, respondents used tablet PCs mainly for online resource searching, class-related reading, language assistance, and taking notes. For nonacademic purposes, students utilized PCs mainly for reading non-academic related materials, chatting, watching videos, listening to music and playing games.

We further explored whether and when tablet PCs are used for non-academic purposes in class. Among 283 respondents with tablet PC, 14 (4.8%) and 60 (21.4%) respondents reported to use tablets PC only and mostly for academic-related purposes in class respectively. In contrast, as many as 190

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(67.1%) students mostly while the other 20 (7.1%) always used tablets PC for non-learning related purposes in class. Additionally 195 (69.0%) declared using their tablet PC for non-academic purposes in short-intervals between two sections of class learning; 170 (59.9%) reported using their tablet PCs when they found the lecture unattractive; and 60 (21.1%) declared use whenever they wanted to.

We also investigated the respondents' attitudes towards tablet PC use in class. Most of them believed that the use of tablet PC in class had both advantages and disadvantages. Of these students, 175 (61.9%) students reported that using tablets PC during class time is distracting. However, 222 (78.6%) students still believed that the use of tablets PC in class has more pros than cons, and none of them agreed that the use of tablet PC only brought harm. Lastly, 155 (54.8%) respondents expect implementation of tablets PC in medical curricula.

At least one learning-related app was used by every respondent regularly, (with figure 3 showing apps that were often used). Popular apps fell into the category of electronic literature and textbooks reading, interactive medical imaging, language assistance, electronic medical resources searching, medical skills training and taking notes. Regarding medical apps that the respondents need besides what are available, many of them expected to have apps for electronic textbooks in Chinese or English for medical curricula, 3D imaging of anatomy, radiology and other courses, online lectures for medical curricula, updated medical journal reading, board exam study, and training for medical skills (like electrocardiography or auscultation). Only 34 (11.9%) respondents were willing to pay for learning -related applications, while the vast majority of students preferred to use free apps.

#### **Discussion and Conclusion**

This study concerns current use of tablet PC and apps by medical students in China, showing that students in a medical school in China have widely adopted tablet PCs for academic- and non-academic - related purposes, with 94.3% owning tablet PCs in this study. It raised our concern that 67.1% of students use tablet PCs mostly for non-academic related purposes in the class, and 61.9% admitted that using tablet PCs in the class is distracting. Most respondents, however are still positive towards the use of tablet PCs in class. These findings indicate that adaptive strategies and proper guidance is required to make medical students minimize the drawbacks of using tablet PC in medical education in this era of information.

A surprisingly high proportion of medical students use tablet PCs in the medical school in China, even though tablet PCs are not essential for any of the courses. Among these respondents, iPad is the most popular tablet PC (88.1%) that is used. To the best of our knowledge, there is only one study published in 2013 that investigated tablet PC use in China<sup>9</sup>. It showed that about 30% of K-12 students in a developed area, among whom 90% were in high school, had their own tablet PCs. Subjects at different stages and from different areas may be the main reasons that our study had much higher tablet PC ownership. A few studies have investigated the nature of tablet PCs usage by medical students outside China. An early study conducted in 2006 in the United Kingdom found that no of medical students had tablet PCs, even though most of them owned desktop PCs or laptops<sup>10</sup>. Another research published in 2013 showed 48.5% of American medical students used tablet PCs, with iPad being the most popular type (41.8%)<sup>8</sup>. Even though China is a developing country, tablet PC and iPad use amongst medical students is much higher than that in America. This may be due to the reason that most tablet PCs were purchased with financial support from students' family in our study, and college students in America are usually financially independent. These studies indicate that tablet PCs are not only widely used in developed countries, but also in developing countries such as China. Mobile device use changes over time, but no researches have reported a dynamic change of tablet PC usage by medical students. We think a rapid increase in tablet PC usage has occurred in recent years, since the launch of iPad in 2010, and almost 90% of students owning tablet PCs had iPad in this study. Therefore, comprehensive researches are urgently needed to understand questions that have not been asked before, such as how tablet PC use is influencing medical education in China, and what are their pros and cons.

We showed that online resource searching, electronic resource reading, language assistance, and taking notes were common reasons of general and in-class tablet PC use for academic-related purposes for these medical students. Advantages of tablet PCs enable these tasks to be more efficient and enhance productivity<sup>11</sup>. Similar to our study, a study conducted amongst college students in a technical college in the Unites States showed that iPad was frequently used for reading, taking notes, online exploration of additional course materials, and interaction with other students, but not for language assistance<sup>12</sup>. Language assistance is perhaps popular amongst students who're non-native English speakers.

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Most of the respondents in this study claimed that they benefited from tablet PC use. A few studies have explored benefits of tablet PC implementation in school. In a series of surveys investigating the impact of iPad use in class throughout a semester, most students reported that iPad encouraged exploration of additional course-related materials, helped with time management, opened new horizons in terms of accessing knowledge, and made the courses more interesting thereby boosting their motivation to learn<sup>13</sup>. In addition, several studies demonstrated that tablet PCs enhanced in-class interaction, students' note-taking ability, facilitate group learning as well as organization of notes and slides, and improving exam performance<sup>7,14,15</sup>. Therefore, tablet PC use does benefit students in many ways while learning. Several medical schools in USA have already adopted tablet PC implementation in medical education, and distributed iPads to medical students<sup>6</sup>. Tablet PC incorporation can be considered by some medical schools in China with the advantage that most medical students already have tablet PC devices and are familiar with its usage.

Despite the positive elements, our findings raised serious concerns as tablet PCs are mostly used for non-learning relevant purposes in class. Most students agreed that tablet PC use in class lead to distraction, and entertainment is one of the main motives to purchase a tablet PC. These results are consistent with other studies that reported digital distraction as a major negative consequence of mobile device use in class<sup>15,16</sup>. A study showed that during a lecture-style class, students kept non-class related software apps open and active on laptops during 42% of time<sup>17</sup>. Several researches have demonstrated that multitasking behaviors on laptop in class lead to poorer academic performance<sup>17-19</sup>. In addition, one recent study<sup>20</sup> found that multitasking on laptops distracted fellow students sitting nearby. However, most medical students in our study are of the opinion that tablet PC usage brought more benefits than harms. In this information era, widespread usage of tablet PC is inevitable, and banning tablet PC use in higher education may be inappropriate. Therefore, adaptive strategies and proper guidance are important and are urgently required to maximize benefits of tablet PCs use in medical education and to minimize possible drawbacks, such as distraction. One strategy that has been used in Veterinary Medical Education is to block non-study related resources in class by using DyKnow, a software only allowing students to use applications like office, course management system, language assistance and PubMed site<sup>15</sup>.

Apps enable users to have easy access to updated and integrated information in a personalized

manner. High prevalence of medical app use was found in our study and by others. A study presented that 76% of medical students with smart phones used medical apps in a medical school in Australia<sup>21</sup>. The pattern of medical apps used in this study was different from ours, since commonly used medical apps were medications guide, discipline-specific quide, clinical handbook, clinical textbooks, exam preparation and clinical skills guide. The study included students at different stages, among whom the majority were in their rotation phase. In contrast, our study only enrolled third year medical students, prior to their rotation. More patient contact and clinical exposure amongst these participants may be the reason why clinical practice associated apps were more frequently used than that in our study. These findings suggest that using medical apps on tablet PC to support study is widely adopted.

Even though there are large numbers of medical apps available now, most of them were designed for medical professionals or the public. As our study shows, for medical students before rotation, there is still a gap between the available apps and the students need. Specific learning related apps are expected, especially those about medical courses and clinical skills. In addition, most of the medical apps are in English, which limits their usage amongst Chinese medical students. Software companies usually decide whether or not and how to develop a new app depending on the potential profit. Our study showed that only a few medical students are willing to pay for their desired apps. For better incorporation of tablet PCs into medical education in China, we believe it important for educational departments, either of government or medical schools, to develop high-guality and free apps for medical students in China. We also found that over half of our respondents expect teachers to recommend good apps for specific courses. With the widespread use of tablet PC among medical students, teachers should shift from recommending extracurricular reading materials to both reading materials and valuable apps.

The major limitation of this study is that only third year medical students from a medical school located in a developed area in China were included, which does not represent tablet PC usage amongst medical students of different stages in China.

In conclusion, the usage of tablet PC and medical apps amongst third year medical students in China is widespread. Most medical students are positive towards tablet PC use, even though non-academic related use and distraction are high in class. Thus, adaptive strategies and proper guidance by medical schools and faculty members are needed urgently to

minimize drawbacks, and to tap beneficial aspects of tablet PCs. More high-quality and free medical apps are needed to help with education among medical students in China.

#### References

- Negi PS, Negi V, Pandey AC. Impact of information technology on learning, teaching and human resource management in educational sector. Internal Journal of Advanced Research in Computer Science. July 2011. Vol 2 (4), pg 66-72.
- Boruff JT, Storie D. Mobile devices in medicine: A survey of how medical students, residents, and faculty use smartphones and other mobile devices to find information. Journal of the Medical Library Association. January 2014. Vol 102(1), pg 22-30.
- Coulby C, Hennessey S, Davies N, et al. The use of mobile technology for work based assessment: the student experience. British Journal of Educational Technology. March 2011. Vol 42(2), pg 251-265.
- 4. Righi RA. The impact of laptop computers on student learning behaviors as perceived by classroom teachers. Theses and Dissertations 2012;417. Available at: http://utdr.utoledo.edu/ theses-dissertations/417. Accessed June 15,2017.
- Berkowitz SJ, Kung JW, Eisenberg RL, et al. Resident iPad use: has it really changed the game? Journal of American College of Radiology. February 2014. Vol 11(2), pg 180-184.
- Thinley P, Geva S, Reye J. Tablets (iPad) for M-Learning in the Context of Social Constructivism to Institute an Effective Learning Environment. International Journal of Interactive Mobile Technologies. 2014. Vol 8 (1), pg 16-20.
- Baumgart DC, Wende I, Grittner U. Tablet computer enhanced training improves internal medicine exam performance. PloS one. April 2017. Vol 12(4), pg e0172827.
- Robinson RL, Burk MS. Tablet computer use by medical students in the United States. Journal of Medical System. August 2013. Vol 37(4), pg 9959.
- Long T, Liang W, Yu S. A study of the tablet computer's application in K-12 schools in China. International Journal of Education and Development Using Information Communication Technology. December 2013. Vol 9(3), pg 61-70.
- 10. Almond L, Chawla G, Brydges S, et al. A discussion of the merits of tablet computers

in medical education. Warwick Interactions Journal 2007;11: 2. Available at: http:// www2.warwick.ac.uk/services/ldc/resource/ interactions/current/abalmond/almond/. Accessed June 15,2017.

- Kothaneth S, Robinson A, Amelink C. Tablet pc support of students' learning styles. Journal of Systemics, Cybernetics, Informatics. November 2012. Vol 10(6), pg 60-63.
- 12. Ventola CL. Mobile devices and apps for health care professionals: uses and benefits. Pharmacy and Therapeutics. May 2014. Vol 39(5), pg 356-364.
- Angst C, Malinowski E. Findings from eReader Project, Phase 1: Use of iPads in MGT40700, Project Management. University of Notre Dame Working Paper Series. 2010;12: 1-17. Available at: http://www.nd.edu/~cangst/ NotreDame\_iPad\_Report\_01-06-11.pdf. Accessed June 15,2017.
- 14. MacLeod C. iPads in the classroom: trials in a technical college in Qatar. Learning and Teaching in Higher Education: Gulf Perspectives. 2015. Vol 12(1), pg 1-16.
- Wang H, Rush BR, Wilkerson M, et al. Exploring the use of tablet PCs in veterinary medical education: opportunity or obstacle? Journal of Veterinary Medical Education. 2014. Vol 41(2), pg 122-131.
- Fried CB. In-class laptop use and its effects on student learning. Computers & Education. April 2008. Vol 50(3), pg 906-914.
- 17. Kraushaar JM, Novak DC. Examining the affects of student multitasking with laptops during the lecture. Journal of Information Systems Education. July 2010. Vol 21(2), pg 241-251.
- Hembrooke H, Gay G. The laptop and the lecture: The effects of multitasking in learning environments. Journal of Computing in Higher Education. September 2003. Vol 15(1), pg 46-64.
- Barak M, Lipson A, Lerman S. Wireless laptops as means for promoting active learning in large lecture halls. Journal of Research on Technology in Education. February 2006. Vol 38 (3), pg 245-263.
- 20. Sana F, Weston T, Cepeda NJ. Laptop multitasking hinders classroom learning for both users and nearby peers. Computers & Education. December 2013. Vol 62, pg 24-31.
- Koehler N, Yao K, Vujovic O, et al. Medical students' use of and attitudes towards medical applications. Journal of Mobible Technology in Medicine. December 2012. Vol 1(4), pg 16-21.

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### Treatment of Osteoarthritis in Basilar Thumb Joints – A Review Article

Brennan C, Knight R

#### Institution

Airedale NHS Foundation Trust, Skipton Road Keighley, West Yorkshire BD20 6TD

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#### Abstract

Osteoarthritis of the hand is a significant problem, with the most recent results published by Arthritis UK showing 6% of people over 45 have sought treatment in 2010. The carpometacarpal joint (CMCJ), or base of thumb, is particularly susceptible to degenerative changes in articular cartilage. Manual workers are predisposed to developing issues, but the condition is also observed in postmenopausal women without a history of increased functional demands. Morphological changes of the joint result in pain, subluxation and instability that have significant impacts on dexterity and consequently productivity. Whilst improvements of symptoms are often noted with immobilising the joint or intra-articular steroid injections, these are merely temporising, with pain returning when normal functionality of the CMCJ is resumed.

Surgical intervention should be offered to those who have not gained adequate pain relief through non-operative measures, in those whom instability is an issue, or in those who have particularly high functional demands meaning non-surgical interventions are unlikely to yield significant and enduring improvements. There is, at present, no golden standard to surgical intervention. Trapeziectomy is the most commonly used procedure. However, even with this, there are many different variations of this technique, suggesting the best approach is still unclear.

#### Key Words

Osteoarthritis; Basilar Thumb Joint, Carpometacarpal Joint; Hand; Surgery

#### **Corresponding Author:**

Miss Christie Brennan; E-mail: Christie.brennan@doctors.org.uk

#### Introduction

Osteoarthritis is a degenerative disease of the synovial joints that causes progressive loss of articular cartilage. Arthritic changes at the carpometacarpal joint (CMCJ), or base of thumb, occur as a separate disease entity to that which is observed in the other joints of the hand. It particularly affects manual workers undertaking repetitive work. However, it may also be observed in up to 25% of post-menopausal women without any history of repetitive strain<sup>1</sup>.

The management of CMCJ osteoarthritis is primarily non-operative and can therefore largely be achieved in primary care. However, failure in resolution of symptoms or unacceptable impact on quality of life should prompt referral to a hand surgeon for consideration of surgical intervention.

#### How Does It Develop?

The water content of healthy cartilage is a finely balanced interplay of compressive forces from

collagen which act to drive water out, and the hydrostatic and osmotic pressures of proteoglycans that draw water in. In OA, the collagen matrix becomes more disorganised and proteoglycan content is subsequently decreased. Loss of the protective effect of proteoglycans ensure collagen fibres are susceptible to degradation, which results in a net increase in the total water content in cartilage. Consequently, cartilage is softer and is more easily and rapidly eroded, until ultimately the bone ends are exposed. Inflammation occurs in response to the degradation, and the presence of cartilage debris further exacerbates the problem.

The articular cartilage of the thumb metacarpal joint is designed to decrease friction and distribute the loading forces across the joint. Anatomically the CMCJ appears particularly susceptible to degenerative change due to the sloping nature of its surface, which is required for the thumb's multiplanar gliding function. The trapeziometacarpal joint is saddle shaped, further enabling the

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movements that define our dexterity. Pincher and grasp grips are provided by a complex arrangement of ligaments encasing the joint. The articular cartilage is initially lost from the volar radial surface of the trapeziometacarpal joint. However, with progression of the disease, the dorsal surface is also affected. Deficiency of the ligamentous complex, particularly the intra-articular palmar beak ligament, has been demonstrated to exacerbate the progression of the disease by subtle shifts in articular contact areas<sup>2</sup>.

#### Presentation

Diagnosis will be made largely on history and examination. It is important to rule out other possible causes of pain at the base of the thumb, including (but not limited to) acute injury to the scaphoid or scapholunate ligament, tenosynovitis, tendinopathies or unrecognised injuries to the thumb or adjacent joints. Insidious onset in the absence of trauma is characteristic, although minor injuries to the thumb may result in an acute exacerbation of symptoms. Up to 50% may present with concomitant carpal tunnel syndrome<sup>3</sup>.

The CMCJ will often exhibit swelling and crepitus. Pain may be reproduced by applying axial loading and circumduction forces to the first phalanx, otherwise known as the CMC grind test. Tenderness on forced manipulation of the CMCJ, may be accompanied by atrophy of the adjacent thenar muscles. On general inspection, a classical rounded appearance at the base of thumb known as 'shouldering' may be present. This is a consequence of subluxation of the joint, adjacent muscle wasting and the persistent pull of abductor pollicis longus on the first metacarpal. Instability within the joint may be reproducible by gentle application of pressure at the base of the metacarpal and attempting to move it over the trapezium.

Finally, radiological diagnosis is demonstrated by the presence of classical OA features, which may specifically include narrowing of trapeziometacarpal joint space and subluxation, as well as sclerosis, osteophyte formation and cystic change. In those cases where the diagnosis is still ambiguous, infiltration of local anaesthetic and corticosteroid can serve as a diagnostic technique, as well as therapeutic procedures.

#### Treatment

#### Non-Operative

The mainstay of treatment should be non-operative, and can be largely done in the primary care setting. Exceptions to this would include cases of particularly severe disease &/or in patients who have high functional demands. Rest and reducing the functional demands on the affected joint generally yield good results, especially when used in conjunction with regular non-steroidal antiinflammatories. However, the pain typically returns when a normal level of function is resumed.

A well applied splint will limit movement and enforce rest. Custom made thermoplastic splints can be relatively easily made by hand therapists, and anecdotally patients appear to report good symptom control. However, the evidence basis for splinting is limited with only one multi-centre randomised control trial demonstrating reduced pain at one year with positional splinting<sup>4</sup>. The optimal splinting position should maintain the thumb metacarpal in pronation, flexion and palmar abduction<sup>5</sup>. Whilst grip strength may not improve, a reduction in pain can help reduce the need for surgery.

Infiltration of corticosteroids into the trapeziometacarpal joint space may not be definitive, but there are several studies to suggest that up to two thirds of patients will gain significant pain relief from this procedure<sup>6,7</sup>. Furthermore, despite the fact that some aspect of pain is likely to reoccur in the majority, it has been demonstrated that most patients are satisfied with their long term outcome by the simple overall reduction in symptoms that corticosteroid injections may offer<sup>7</sup>. However, for those who gain good but transient control of symptoms, there is still a lack of clarity regarding how many injections can be given and over what period of time, with in vitro studies raising concerns about the chondrotoxic effects of corticosteroid on articular cartilage<sup>8</sup>. Clinicians may choose to consider hyaluronate injections for symptomatic control. However, no objective improvement in analgesia and function has been demonstrated when compared to placebo and corticosteroids.9

#### Operative

Failure of non-operative management with persistent, worsening pain, and/or weakness and instability of the joint that negatively impacts on the patient's quality of life, should prompt a referral to a hand surgeon. There are many variations in operative techniques. These can largely be attributed to surgeon preference or skill, as well as the need to tailor surgical intervention in targeting specific symptoms.

#### Mild Disease

#### Abduction-Extension Osteotomy

Early disease may be managed by removing a small wedge of bone from the first metacarpal. This aims to redirect the loading force on the trapeziometacarpal joint more dorsally to a lesser

affected portion of the joint, thus avoiding the more degenerate areas. Outcomes are often very good, although patients frequently present with disease too advanced to ensure that this surgery is effective and therefore its use is limited.

#### Ligament Reconstruction

For those whom pain is as a consequence of instability or a hypermobile joint, the supporting ligaments may be reconstructed using a portion of the flexor carpi radialis (FCR) tendon or biosynthetic material. The major ligament that contributes to the stability of the trapeziometacarpal joint is the palmar beak ligament (deep anterior oblique ligament), and attenuation of this ligament leads to subluxation. The widely accepted approach to palmar beak ligamentous reconstruction is the Eaton-Littler technique, in which a drill hole is made in the base of thumb metacarpal. The FCR slip is released distally until it's insertion on the index metacarpal, and is then rerouted through the drill hole under the abductor pollicis longus insertion, before being secured on the radial aspect of the joint<sup>10</sup>. One disadvantage of this procedure is that's its long-term success is dependent on the articular surfaces being eburnation-free, which can only be adequately assessed by arthrotomy and inspection of the joint surfaces intraoperatively.

#### Mild to Moderate Disease

### Trapeziometacarpal Arthrodesis

Arthrodesis refers to fusion of the joint, which is often achieved using mini plates and screws, tension banding or compression screws. The optimal position for the CMC joint to be fused in is 30° palmar abduction, 35° radial abduction and 15° pronation. This position allows for perseveration of pincher grip, therefore this technique is often indicated in younger manual workers for whom grip strength is particularly important. It is important to note that the benefits in terms of improvement in pain, stability and preservation of the length of the digit, may be offset by a reduction in range of movement. Furthermore, if degenerative change extends beyond the trapeziometacarpal joint, isolated arthrodesis is unlikely to provide significant relief of symptoms.

### Arthroscopic Surgery

Arthroscopic debridement and synovectomy within the trapezoimetacarpal joint is, at present, not a procedure that is commonly undertaken by many hand surgeons. However, increased skills and expertise in the field of arthroscopic surgery may mean that adequate control of pain and relief of symptoms using minimally invasive operative techniques, may become more readily available in the near future.

#### Moderate to Severe Disease

#### Trapeziectomy

This is the most commonly performed procedure for basilar thumb osteoarthritis. There are several different approaches, which suggests that the best approach is still unclear. However, trapezial excision to remove the arthritic joint is the most important common denominator regardless of other specifics of arthroplasty. Although pain is often relieved, loss of thumb strength and stability may be experienced by the patient due to subsequent collapse and shortening of the thumb metacarpal into the empty joint space. The trapeziectomy has been repeatedly modified in an attempt to combat these issues including concurrent metacarophalangeal joint stabilisation, distraction pinning of the first metacarpal and tendon interposition of palmar beak ligament reconstruction. Reviews of evidence have shown that no one surgical intervention is superior but that a simple trapeziectomy generally yields fewer complications<sup>11</sup>.

#### Joint Replacement Surgery

Prosthetic TMJ arthroplasty may be broadly divided into three categories:

(i) those that involve resurfacing either the trapezium or the metacarpal base

- (ii) trapezium replacement arthroplasties
- (iii) whole joint replacement.

More traditional silicone prostheses are no longer used due to their susceptibility to mechanical wear. Development in biomaterials and operative technique means that replacement surgery may be an intervention that is considered more readily in the future. However, replacing the joint has not yet been demonstrated to be superior in terms of improvement of pain, impairment and disability when compared to trapeziectomy and ligament reconstruction<sup>12</sup>. Furthermore, given the implant's greater cost, it should not be recommended as a first line choice in the management of basal joint osteoarthritis of the thumb.

#### Conclusion

Of the operative techniques considered, trapeziectomy is most commonly used to manage CMC joint pain associated with basilar thumb osteoarthritis. However, at present there is no gold standard to managing this condition, given that no single technique appears to be superior in terms of both post-operative pain control and functionality. Arthrodesis may offer superior post-operative pain control. However, it has an overall prolonged recovery time (due to a period of immobilisation in plaster and subsequent rehabilitation). Furthermore,

it may also lead to limitation of the mobility of the thumb, especially in retropulsion, thus decreasing overall manual dexterity.

With advances in operative techniques and surgical biomaterials, we may begin to see the novel surgical interventions become more common place, in an attempt to establish a rigorous evidence basis in providing specific treatment recommendations. However, in the interim once non-operative interventions have failed, as a universal rule a range of surgical interventions should be considered and tailored according to the patient's age, occupation and level of functional demand, as well as on the features (clinical and radiological) of the arthritic process.

#### References

- 1. Armstrong AL, Hunter JB, David TR. The prevalence of degenerative arthritis of the base of thumb in post menopausal women. J Hand Surg Br. 1994; 19:340-1
- Pellegrini VD, Olcott CW, Hollenberg G. Contact patterns in the trapeziometacarpal joint: the role of the palmar beak ligament. J Hand Surg Am 1993; 18A:238-44
- Florack TM, Miller RJ, Pellegrini VD, Burton RI, Dunn MG. The prevalence of carpal tunnel syndrome in patients with basal joint arthritis of the thumb. J hand Surg Am. 1992 Jul 17(4): 624-30
- 4. Rannou F, Dimet J, Boutron I, Baron G, Fayad F, Macé Y, et al. Splint for base-of-thumb osteoarthritis: a randomised trial. Ann Intern med 2009; 150:661-9
- 5. Neumann DA, Bielefeld T. The carpometacarpal joint of the thumb: stability,

deformity and therapeutic intervention. J Orthop Sports Phys Ther 2003; 33:386-99

- Swindells MG, Logan AJ, Armstrong DJ, Chan P, Burke FD, Lindau TR. The benefit of radiologically-guided steroid injections for trapeziometacarpal arthritis. Ann R Coll Surg Engl 2010; 92:680-4
- Maarse W, Watts AC, Bain GI. Medium term outcome following intra-articular corticosteroid injection in first CMC joint arthritis using fluoroscopy. Hand Surg (Asian) 2009; 14:99-104.
- Day CS, Gelberman R, Patel AA, Vogt MT, Ditsios K, Boyer MI. Basal joint osteoarthritis of the thumb: a prospective trial of steroid injection and splinting. J Hand Surg Am 2004; 29: 247-51
- Waltervan der Weegen, Wullems J, Bos E, Noten H, van Drumpt R. No Difference Between Intra-Articular Injection of Hyaluronic Acid and Placebo for Mild to Moderate Knee Osteoarthritis: A Randomized, Controlled, Double-Blind Trial. J Arthroplasty. 2015. 30 (5):754-757
- Iyengar K, Grandham S, Nadkarni J, Loh W. Modified Eaton-Littler's Reconstruction for Traumatic dislocation of the Carpometacarpal joint of thumb – a case report and review of literature. J Hand Microsurg. 2013. 5(1): 36-42
- 11. Wajon A, Carr E, Edmunds I, Ada L. Surgery for thumb (trapeziometcarpal joint) osteoarthritis. Cochrane Database Syst Rev 2009:4:CD004631
- Vandenberghe L, Degreef I, Didden K, Fiews S, De Smet L. Long term outcome of trapeziectomy with ligament reconstruction/ tendon interposition versus thumb basal joint prosthesis. J Hand Surg Eur. 2013; 38(8): 839-43

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