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Andréas O'Neill
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andreas.oneill@gmail.com
tel: 073-705 55 57

Handledare

Martin Wohlin
Leg lärk, med dr
Akut sjukvården
Akademiska sjukhuset, Uppsala
martin.wohlin@medsci.uu.se
tel: 070 2-02 47 43
Creating a Student ER

- A qualitative study of a pilot project in medical student training in Emergency Medicine

Aindreas O’Neill
Medical Student
aindreas.oneill@gmail.com
Uppsala University Medical School
tel: +46737055757

Supervisor
Martin Wohlin MD, PhD
Dept of Medical Sciences
Uppsala University Hospital
martin.wohlin@medsci.uu.se
tel: +46702024743
Eschew obfuscation! Espouse elucidation!

- Anonymous

To my mother and father,
morfar och mormor,
and Grannie and Grandad
thank you all for everything,

and to my cousin Kristoffer, without whom I would not have gotten this far.

Illustrations by Kjell Häftén, kjellhaften@gmail.com
Abstract

Background: The Emergency Room (ER) at Uppsala University Hospital (UUH) recently changed its organisational model to a more industrialised lean one. This has been perceived as having a negative impact on the clinical rotations of the medical students at the ER. The aim of this project was to investigate whether or not the implementation of an Interprofessional Student ER (IPTER) is a feasible way to improve the medical students’ rotation. In the IPTER, medical students under supervision manage the patients as independently as possible.

Methods: A literature study was performed to survey relevant studies done on Interprofessional Education (IPE) in Sweden. Visits to various IPE projects involving health care students gave practical insights and instructive examples. A pilot project was set up for one week in the UUH ER. The pilot was logged day-by-day and the opinions of the students and the supervisors were recorded through focus group sessions.

Results: It proved impossible to include nursing students, so the pilot proceeded with only medical students. 11 patients were treated via the IPTER, all but two of them within the 4-hour limit. Each student managed 1-2 patients per day from start to finish. Student satisfaction was high. There was no increased workload for the regular ER staff.

Conclusion: Setting up an IPTER in the UUH ER is a feasible way to allow medical students under supervision to manage patients seeking acute medical care. There is sufficient patient in-flow, but the premises need to be expanded. Further work and studies are needed to include nursing students and to investigate the educational benefits of the IPTER project.

Keywords: interprofessional education, emergency care, undergraduate, medical student

Aindreas O’Neill, Medical student (a); Martin Wohlin MD, PhD (b)

a) Uppsala University, Sweden b) Department of Medical Sciences, Uppsala University, Sweden

Corresponding author

Aindreas O’Neill, Medical student, Uppsala University
Odensgatan 4a, SE-753 15 Uppsala, Sweden
Phone: +46 737055757 E-mail: aindreas.oneill@gmail.com
Acronyms, definitions and Swedish terms used

AT “Allmäntjänstgöring”, mandatory 18 months of internship, after which the physician receives his or her license to practice medicine.
CBA Controlled before-and-after study
CVI Cerebrovascular insult
DVT Deep Vein Thrombosis
ER Emergency Room
ED Emergency Department
IPE Interprofessional Education
IPTER Interprofessional Training Emergency Room
KI Karolinska Institute
LiU Linköping University
LMWH Low Molecular Weight Heparin
NICU Neuro-intensive Care Unit
OT Occupational Therapy
PT Physiotherapy
IPTW Interprofessional Training Ward
ST “Specialisttjänstgöring”, the term for a licensed physician who is pursuing a specialty
RCT Randomised Controlled Trial
PBL Problem-based Learning
UUH Uppsala University Hospital
UU Uppsala University
WHO World Health Organisation

In general, the American terms intern, resident, and attending are used in place of the corresponding Swedish terms AT-läkare, ST-läkare, överläkare.
Sammanfattning


Background

Uppsala University was founded in 1477, and is the oldest university in Scandinavia. The Uppsala University Medical School has been educating physicians since the 1613 inauguration of Johannes Chesnecopherus, the first professor at the Medical Faculty (NE).

The latest revision of the Uppsala Medical School curriculum was the launch of a completely revised curriculum in the spring of 2006. In particular, the new curriculum differs in using a PBL-based pedagogy and emphasising early contacts with patients in a primary-care setting, the latter consisting of one afternoon every other week for the first 4 semesters.

In Sweden, students graduate from medical school with a “läkarexamen”, roughly equivalent to an American MD. Medical school consists of 5.5 years divided into 11 semesters. Students at Uppsala University Medical School start their clinical duties during their third year, the course-load for the two first years being predominantly pre-clinical basic sciences such as physiology, anatomy, pharmacology etc. Upon graduating medical school, physicians undergo 18-24 months of internship, called “Allmäntjänstgöring (AT)”, after which the physician can apply for a license to practice medicine, issued by Socialstyrelsen (The National Board of Health and Welfare).

Uppsala University Hospital was founded in 1708. Currently it is holds 1100 beds and employs upwards of 8000 people, 1100 of which are physicians (UUH homepage, 2011). The medical part of the Emergency Department (ED) receives upwards of 70 patients each day (personal communication, Susann Järhult). Following the new curriculum, the medical students have two courses in emergency medicine: a 4-week course during the first clinical semester and one course in the last semester. With the relatively high patient turnover the ED, and particularly the Emergency Room (ER), has long been regarded by medical students as the best place to gain clinical experience.

A new organisational model has recently been established in the ER, emphasising a team approach to the patient, where a team consisting of an attending physician, a junior physician, a nurse and a nurse’s assistant see the patient together and decide what diagnostic and therapeutic steps to take. This contrasts with the previous organisational model, where the patient in turn would be seen by a nurse to check vital signs and take a short history, and then by a physician. This gave time for the medical student to see the patient after the nurse, taking a full history and performing a physical examination, after which the student would report the findings to the treating physician. Ideally, this approach allows the student to offer his or her own reasoning concerning appropriate treatment and further diagnostic efforts, facilitating the creation of a learning situation in which the treating physician can critique the student’s reasoning and diagnostic skills, as well as impart their own
knowledge.

The new system could potentially omit the role of the medical student, thereby sharply decreasing the frequency with which students are allowed to independently examine patients and take histories. In such a scenario, the educational value for medical students in the ED would be considerably diminished. Upon graduation, almost all Swedish physicians perform clinical duties in the emergency room. Thus, it is vital that the medical students receive a fundamentally sound education in emergency medicine.

At least two teaching hospitals in Sweden – Karolinska University Hospital and Danderyd University Hospital, both located in Stockholm – have ongoing projects in which a certain number of ED patients are treated through a special part of the ER, where medical students and nursing students working together in an interprofessional environment, supervised by physicians and nurses, are responsible for the treatment of the patient. This approach could potentially alleviate the perceived decline in educational value, and decline in opportunity to practice the clinical skills of history-taking and physical examination, that the new team-based organisation has caused.

Interprofessional Education – definitions and evidence

CAIPE, Centre for the Advancement of Interprofessional Education, defines interprofessional education as occurring when "(...) two or more professions learn with, from and about each other to improve collaboration and the quality of care" (CAIPE, 2002). The World Health Organisation
(WHO) definition differs somewhat in emphasizing a student perspective and focusing directly on outcomes, defining IPE as occurring when “students from two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes” (WHO 2010, p.7). Furthermore, the WHO states in a 2010 report that interprofessional education is necessary to prepare “collaborative practice-ready” health professionals who, in turn, are better prepared to respond to local health needs. The WHO defines collaborative practice as occurring when “(...) multiple health workers from different professional backgrounds work together with patients, families, carers and communities to deliver the highest quality of care” (WHO 2010, p7.).

Collaborative practice is singled out in the report as strengthening health systems and improving patient outcomes, and IPE is, in turn, singled out as a key contributing factor in making health workers collaborative practice-ready.

This statement is not without controversy, as several researchers have commented on the lack of evidence supporting the efficacy and lasting effects of IPE. Indeed, a 2000 Cochrane review failed to find a single study that met the inclusion criteria of Randomised Controlled Trial (RCT) or Controlled Before-and-After study (CBA) (Zwarenstein, 1999). A follow-up review in 2009 found 6 studies that were included, four RCT:s and two CBA:s. Of these studies, four reported positive outcomes, notably in collaborative team behaviour and reduction of clinical error rates for ER teams. Additionally, two of the studies reported no impact of IPE interventions on professional practice or patient care (Reeves et al, 2009). The authors reported their findings in a 2010 article, where they concluded with an appeal for more randomised controlled studies with larger sample sizes, that would vastly improve the evidence for IPE:s efficacy (Reeves et al, 2010). Interestingly, none of the studies included featured medical students or other undergraduates in healthcare. As much of the current debate concerns the inclusion of IPE in the education of health professionals as undergraduates, the evidence base regarding the effects of IPE in undergraduate education must be considered lacking.

Bearing in mind the above declared state of evidence for IPE, it is hard to escape the conclusion that the WHO support of IPE is based on ideology rather than evidence. That said, the Cochrane review states that other studies, (Barr et al, 2005; Cooper et al 2001) reported positive outcomes for IPE interventions, although the review does not deem them fit for inclusion as regarding to the study design.

CHMS, the Council of Heads of Medical Schools in the UK, put forward a position paper concerning IPE in 2003. In this paper the principle of IPE was embraced, under “the clear understanding that the integrity and quality of uni-professional medical training is protected”. The paper singles out certain aspects as particularly suited to IPE, such as key clinical skills (checking
vital signs etc.) and communication skills. The need for the effects of IPE to be “…vigorously researched…” and for outcomes to “…prompt a re-evaluation of IPE in medical school…” is emphasised. Setting up two polar positions, the first being promotion of IPE regardless of cost and the second being resistance to IPE regardless of evidence base, the paper states that “A position between these extremes might recognise the wisdom of pursuing IPE opportunities cautiously to continue to ensure the technical competence of doctors of the future” (CHMS, 2003).

As we see in the above statement, there are concerns that medical student education may be compromised by the introduction of IPE into already overloaded curricula. A Swedish study compared the degree to which newly graduated doctors from all six medical schools in Sweden felt that their undergraduate education had prepared them in different areas. The data comes from a survey conducted annually by the Swedish Medical Association, and for the study data from 5 years was used, with a total $N=3534$. Concerning the medical students’ confidence in medically handling acute patients, the results are remarkably similar over time and between different medical schools. In Sweden, the Linköping University (LiU) Medical School differs in having a heavy emphasis on IPE, in the form of at least 10 weeks of IPE and two weeks in an IPTW. During the time for the study, LiU was also unique among Swedish medical schools for its commitment to PBL. The Linköping students reported significantly ($p < 0.0001$) more confidence in their abilities to cooperate with other professions and in their interprofessional skills, averaging 5 on a 6-point scale as compared to an average of 3 for the other Swedish medical schools (Faresjö et al, 2007).

Thus, there appears to be evidence that the implementation of IPE does not affect the competence of newly graduated physicians to handle acute patients, and in fact increases their ability for interprofessional co-operation, as measured by their own confidence in their capabilities.

From this, one might assume that the graduates of Linköping University Medical School have a more positive attitude towards the collaboration between doctors and nurses. However, a study comparing final year medical students from Göteborg University, the curriculum of which does not include IPE, and Linköping University, found no significant differences. The study used the Jefferson Scale of Attitudes towards Nurse-Physician Collaboration, but failed to find any significant difference between the medical students. A significant difference was found between male and female medical students, with female students being slightly more favourable towards physician-nurse collaboration, though the authors stress that this difference is unlikely to have any practical significance (Hansson et al, 2010).

In a retrospective article chronicling Linköping University’s experiences after 20 years of IPE, Nils-Holger Areskog summarises thusly: “Has the undergraduate IPE had any effect upon health care
delivery by some 10,000 professionals who are its alumni? Evidence is mostly anecdotal” (Areskog, 2009).

Regardless of the lacking and sometimes conflicting evidence for IPE, there can be no doubt that it is an area of great interest to policy makers, students, and faculties around the world.

**IPE in Sweden**

Before the 2010 accreditation of Örebro University to start a medical school, the youngest medical school in Sweden was Linköping University Medical School. Originally, medical students would study their first two years in Uppsala, whereupon they would move to Linköping and do the last three-and-a-half years of clinical training. A proposal to shut down this collaboration prompted a re-evaluation of medical education in Linköping. The end result was that a new medical school opened in Linköping, with the new curriculum departing in two ways from traditional medical curricula in Sweden: PBL was used in a majority of courses, and IPE was introduced (Wilhelmsson et al, 2009). Since the university already had undergraduate programs for many health-care professionals, notably students pursuing degrees in nursing, occupational therapy (OT) and physiotherapy (PT), the decision was made to include IPE courses at an undergraduate level. Since then, the form of IPE at Linköping University has continually evolved.

All in all, the faculty has allocated 12 weeks of IPE in the curricula of the following undergraduate programs: medicine, nursing, occupational therapy, physiotherapy, medical biology and speech therapy. The first course, called HEL 1, consists of 8 weeks in which different concepts such as health, society, medical ethics etc are approached through lectures and PBL sessions. In the PBL sessions, students from all different programs participate. The goal is to find common values and to introduce the students to the different professions and competences in health care. As this is the first course taken by many of the students, they have not yet developed professional skills in their chosen areas.

The next step of IPE, called HEL II, centres around sexology. This subject was chosen because it incorporates many different aspects; societal, medical, personal amongst others, and the subject provides rich material for discussion amongst the students. The course consists of two weeks.

The final course in IPE takes place at the IPTWs and is given in the eleventh semester for medical students. For a more thorough presentation of the IPE curriculum at Linköping University, see (Wilhelmsson et al, 2009).

**The Interprofessional Training Wards**

After ten years of IPE at Linköping University, a major step was taken: the launch of an IPE
training ward, the first of its kind in the world (Walhström et al, 1996). Historically, there has been some confusion regarding terminology for this type of ward: they have been called CEW:s (Clinical Education Wards), a direct translation of the established Swedish label KUA (Klinisk undervisningsavdelning). In recent years, the term IPTW (Interprofessional Training Ward) has been established.

In the IPTW, undergraduates from many different health professions work together in a clinical ward with real patients. The students, regardless of future profession, are responsible as a team for the basic care of the patients regarding personal hygiene, meals etc. Typically the students are comprised of two teams alternating day and evening shifts, with regular personnel filling in the night shifts. The specific needs of the patient (medical, nursing, rehabilitation) are the responsibility of respective profession. With support from licensed health professionals acting as supervisors and tutors, the students then work at the IPTW for one or two weeks. Feedback is typically highly structured, with supervisors and students commenting on teamwork and communication during two 30-minute feedback session, at the beginning and end of each shift.

Since the opening of the first IPTW in Linköping, the concept has spread over Sweden. In orthopaedic surgeon Uffe Hylin’s doctoral dissertation, he counts at least 13 IPTWs in Sweden featuring medical students, as well as several others featuring undergraduates from other health professions (Hylin, 2010, p14). The most prevalent organisation of the student team seems to be 1
medical student, 2-3 nursing students, 1 OT student and 1 PT student. These are in turn supervised by 1 physician, 2-3 nurses, 1 occupational therapist and 1 physiotherapist. The first IPTW was an orthopaedic ward, and indeed a majority of training wards in Sweden are either orthopaedic or geriatric wards.

The learning goals of the IPTW course are twofold – there are profession-specific goals and goals common for all students. The common goals include development of one’s own professional role, training in communication with other team members, increased awareness of the ethical aspects of health-care and enhancement of level of understanding of the other professions (Hylin, 2010, p15). The profession-specific goals are determined by the course in which the IPTW clinical duty is included.

For the medical students at KI, the profession-specific goals include leading the medical treatment in co-operation with the team, individually taking a history and performing examinations, routine work concerning admissions, amongst others. All the profession-specific goal lists include developing an understanding for the patients’ needs concerning the other professions: for the medical student, nursing, occupational therapy and physiotherapy, respectively. Also included in the medical students’ goals is participating in operations and attending the out-patient clinic; however these goals cannot be said to be particularly emphasised, as the medical students are to fulfil them only if time allows (Hylin 2010, p15).

Analogous to the two different sets of goals, the students’ have two different supervisors. A profession-specific tutor, being an orthopaedic surgeon for the medical students, and team supervisors, who are always nurses. Notably, the orthopaedic surgeon is only present at the IPTW 4-6 hours per day – the remaining time the medical students lack profession-specific supervision. Since the two shifts amount to 14.5 hours per day, the medical students have profession-specific supervision only 30-40% of the time, in sharp contrast to the nursing students who have full-time profession-specific supervision. This can explain the lower ratings for profession-specific supervision given by medical students, averaging 6.9 on a 9-point Likert scale, compared to 7.6 for the nursing students (Hylin 2010, p28). A positive correlation between satisfaction with supervision and students’ attitude towards the IPTW has been found (Ponzer et al, 2004)

As we see in the above description of the IPTW-course, the students are brought together as a team and are required to plan ward duties themselves. At an ordinary ward, the patients’ needs regarding personal hygiene, meals etc would usually be fulfilled by a certified nurse assistant (Swedish: undersköterska). The lack of these at the IPTW means that the students’ workload will be directly affected by their own day-to-day planning, since no-one else works at the ward. It also means that a substantial amount of the day’s work is taken up by tasks that none of the students will do in their
The decision to not include nurse assistants is described variously in the literature as due to “organisational circumstances” (Lindblom et al, 2007) and as part of the pedagogical approach to promote active and realistic teamwork between the students (Wilhelmsson et al, 2009; Hylin 2010, p13).

The IPTW course is for the medical students usually included in the orthopaedics rotation. In the Swedish system, a typical orthopaedics rotation in the medical school curriculum consists of 3-4 weeks of clinical duty where the student takes part in the daily routine of an orthopaedic surgeon. In general, this would include ward duties, operations, out-patient clinic time, and on-call work in the emergency room. As is described above, the IPTW course includes only one of these different activities, being ward duty. Thus, despite the fact that the course takes place at an orthopaedic ward, it is hard to escape the conclusion that the medical students in the IPTW see a smaller spectrum of orthopaedics than their peers. At KI, the inclusion of the IPTW course shortened the orthopaedics curriculum by two weeks, something that led to pronounced frustration among the medical students (Lindblom et al, 2007). Additionally, during the afternoon rounds there was no orthopaedic surgeon present, meaning that the medical student on the evening shift team was without profession-specific supervision for the entire shift.

In the 2007 study by Lindblom et al, the opinions of the medical students rotating at an orthopaedic IPTW in Huddinge University Hospital, Stockholm, were followed over the course of several semesters. During the first semester, the medical students were present in the IPTW in either the day shift team or the evening shift team. Subsequent evaluations showed that the medical students estimated that 7-17% of the time spent was directly related to their training in orthopaedics. In order to combat this, a modified schedule was introduced in the second term, wherein the medical student would leave the ward at 3:00 pm to follow the orthopaedic surgeon on call and to see patients in the ER.

While this adjustment was successful in increasing the time spent on orthopaedics training overall, there was still a large variation in the students’ estimations of the amount of time spent on orthopaedics training, ranging from 7-44%. In the article, the authors speculate that this may be due to tensions between the medical students and the other students, as the medical students would be absent for the evening shift. The medical students may also have been hampered by a sense of loyalty towards the team, making it difficult for them to go to the ER, as the team would then be short 1-2 students, increasing the workload for the remaining students (Lindblom et al, 2007).
Thus, the question has been raised if there is an inherent conflict in the IPTW between the medical students’ orthopaedics training and the running of the actual ward. Given the fact that there is a noticeable discrepancy between the time spent on orthopaedic curriculum in medical school and the amount of patients suffering from musculoskeletal disorders, particularly in primary and emergency care, the wisdom in taking time from the regular orthopaedics course and spending it exclusively at the IPTW, thereby committing a large part of each day to doing nurse assistant work as a part of interprofessional training in teamwork, can be questioned (Pinney et al, 2001). This possible problem can be presumed to be smaller at the IPTWs caring for geriatric patients, as the geriatrics curriculum in medical school typically does not include the ER duties and specific clinical skills – such as bone setting, localised anaesthesia etc – that feature prominently in the orthopaedic curriculum. The medical students felt that their level of care without supervision was lower than the other students.

In his dissertation, Uffe Hylin criticises the decision to let the medical students spend time in the ER during the afternoon shifts, regarding it as “a way to restrain the students’ opportunities to learn with each other” (Hylin 2010, p51, emphasis original). While agreeing that more time should be spent on orthopaedics in medical school, Hylin regards the proposed conflict between IPE and orthopaedics as “artificial”, given that orthopaedics is a topic and IPE is a method.

The argument is sometimes made that medical students need to understand how a ward operates and the work done there to fully comprehend the challenges faced by nurses and nurse assistants. However, a vast majority of medical students (in one study over 80%) have experience working in health care, usually as a nurse assistant (Lindblom et al, 2007), calling into question the validity of this particular argument.

The patients being treated at the IPTWs vary from ward to ward. Many orthopaedic wards exclusively treat patients with degenerative joint disease who are treated pre- and postoperatively at the ward after undergoing joint replacement surgery. Additionally, patients admitted to the IPTW typically have no cognitive difficulties and are not seriously ill. While facilitating the planning of the treatment, this also means that the students only see this type of patient. For the students, this means that they do not gain any clinical experience in the diagnostic, rehabilitary, and therapeutic particulars in treating patients with other types of orthopaedic injuries such as fractures.

In summary, studies on IPTW show that students as a whole rate their own understanding of their professional role higher after completion of the course, going on average from 6,5 to 7,8 on a 9-point scale. A substantial portion of students reported no difference; however, almost all these students already rated their understanding of their professional roles as an 8 or 9. Also of note, 6% of medical students rated their perception of their professional role as lower after the course. While
maintaining a fairly high score of 7.2, the medical students rated their attitudes towards the IPTW concept lowest of all the student categories after the course, with a significant difference compared to nursing and OT students (Hylin, 2010 p28).

There were some initial concerns in entrusting the care of authentic patients into the hands of students, even with constant supervision of licensed nurses and physicians. However, the patients treated at the IPTWs have ranked their satisfaction with care as high as patients treated at regular wards. Additionally, Uffe Hylin reports that it is his personal experience that patients previously treated by health care students request to be admitted to the same ward again, having been satisfied with their care and the information they have received (Hylin 2010, p55). Thus, it seems a reasonable conclusion that patient safety is not in any way compromised.

The IPTER concept
In 1999, when the IPTWs were established in Sweden, the Karolinska University Hospital chose another approach. Instead of an interprofessional training ward, they introduced IPE for undergraduates in an emergency room setting. Anne Ericsson, attending orthopaedic surgeon and director of the undergraduate medical student orthopaedics course, was the key person in organising this. Analogous to the term “KUA”, the student ER was called KUM (Klinisk undervisningsmottagning – Clinical educational practice). As of yet there have been no published studies on this project, which to the best of my knowledge is the first of its kind in the world (personal communication, Anne Ericsson). Research into the literature has not found any published works on similar projects.

Hence, there is no established English term corresponding to the Swedish KUM. In brochures from Karolinska Hospital the term SED (Students Emergency Department) is used. While accurate and descriptive, this term in my opinions fails to highlight one of the most significant aspects of these projects – the interprofessional aspect. For this paper I will coin and use the term Interprofessional Training Emergency Room (IPTER). In Sweden there are currently IPTERs present in at least two university hospitals, being Karolinska University Hospital and Danderyd University Hospital.

The Karolinska IPTER
As mentioned above, the Karolinska IPTER was started in 1999. The following short recapitulation of its history comes from personal communications with Anne Ericsson. The decision to not start an IPTW was made due to scheduling problems, as it was not deemed possible to include in the last semesters of medical school. The decision to include two weeks of IPE for the medical students was already made by KI, and so the IPTER was started to fulfil this goal.
Initially, the IPTER was only used for orthopaedic ER patients. Subsequently, it was introduced for surgical patients in 2004 and for medical patients in 2006. These three pedagogical projects are managed by the respective departments.

As in the IPTWs the pedagogical approach is to let the students manage the patient as independently as possible, both regarding informing the patient and performing specific clinical tasks, with constant access to their respective supervisors. This means that the students, to as high a degree as possible, place catheters and IV:s, set bones, make plaster casts, perform lumbar punctures etc.

During the fall of 2010, in preparation for starting an IPTER at UUH, I visited the Karolinska IPTER.

There are two shifts of 6 hours, manned by two student teams and their respective supervisors. The teams consist of 2-3 medical students, 2 nursing students, and, at the orthopaedics IPTER, 1 physiotherapy student. The teams are kept consistent throughout the two week course. The students are supervised by one orthopaedic surgeon, usually a senior specialist, one licensed nurse, and, at the orthopaedics IPTER, one physiotherapist. Thus, the students have constant profession-specific supervision.

The patients are regular patients seeking acute medical aid. All patients received at the Karolinska ER are screened to determine if they are suitable to be treated via the IPTER. Other than trauma codes, there are few restrictions regarding patients that can be treated via the IPTER. Examples of diagnoses managed through the IPTER include hip fractures, acute abdomens, kidney stones, radial fractures.

After a suitable patient has been triaged to the IPTER, the nursing student sees the patient, taking blood samples, vital signs, and a short history, while a medical student consults the patient’s medical records. The nursing student then reports to the medical student, prompting a short discussion concerning the patient. The medical student then sees the patient, taking a full history and performing a physical examination. The medical student then discusses the patient with the nursing student, taking into account the results of the history and physical examination, after which the students present the patient together to the supervisors, making suggestions as regarding to further diagnostic and therapeutic efforts. During the following discussion, differential diagnoses are taken into account, and the clinical reasoning of the students is critiqued by the supervisors. Ultimately, a course of action is decided upon, after which the students proceed to take the necessary steps: writing referrals for radiological exams and consultants, admitting the patient, discharging the patient, reporting the patient to the ward etc. The work is done exclusively by the
students, consulting with the supervisors as necessary, with the supervising physician being responsible for the patients' treatment and the supervising nurse being responsible for the patient’s care.

As seen in the above example, the students exclusively occupy themselves with tasks pertaining to their future professions. There is no team supervisor as such, though naturally the two (three) supervisors communicate amongst each other. As in the IPTWs, structured feedback is given concerning note-keeping, clinical skills, team work, communication, students knowledge etc. Specific cases of interest are discussed in the group.

During a 6-hour shift, the medical students manage on average 2-3 patients each, meaning that the nursing students manage 4-6 patients per student and shift. All in all, this means that the supervising physician has treated upwards of 9 patients, a significant contribution by Swedish standards.

The physicians acting as supervisors at the orthopaedic IPTER are predominantly senior orthopaedic surgeons. During evening shifts, the supervisors are sometimes emergency physicians. The physicians exclusively manage the students’ patients, and do not partake in the regular work at the ER. The nursing supervisors work at the Karolinska ER, and rotate at the IPTER as part of the regular schedule. This ensures that the nursing staff at the ER is familiar with the IPTER and the special conditions it entails, an enormous help in ensuring that appropriate patients are triaged to the IPTER.

Likewise, at the surgical ER, the supervising physician is an attending during the daytime and an emergency physician during evening shifts. At the medical ER, all of the supervising physicians are emergency physicians by training.

All three IPTERs at Karolinska have their own examination rooms and team rooms, ensuring that emergency room overcrowding affects the students as little as possible. In situations when the resources of the ER are severely stretched, appropriate measures are of course taken, primarily by speeding up the management of the patients to free examination rooms and beds at the ER.

The patients’ opinions on the care they have received have been systematically evaluated at the Karolinska IPTER for >10 years, and the conclusion is that the patients are satisfied with the care they have received. According to Anne Ericsson, the patients value in particular the extensive physical examinations performed by the medical students and the fact that there is time to inform the patient thoroughly of their condition and planned management. This is in accordance with the reported patient satisfaction with the care received at the IPTWs. All in all, 1500 patients are received annually at the three Karolinska IPTERs.

Anne Ericsson also reports that the IPTER places first when the students rank their clinical
rotations, before the IPTWs. This holds true both for medical, nursing, and physiotherapy students.

The Karolinska IPTERs are financed in part by funds allocated specifically for the education of medical students. Medical supplies and computers, as well as secretarial duties, are financed by the Karolinska ER. In particular, the cost of physician supervisors forms a substantial part of the overall cost of operation.

**The Danderyd IPTER**

Danderyd University Hospital Department of Medicine provides clinical rotations for upwards of 60 medical students per year. The medical section at the Danderyd ER changed to a team-based organisational model in the autumn of 2009. As was seen in Uppsala, this brought about changes for the medical students, in particular making it difficult for them to see patients independently. To combat this, an IPTER was set up, modeled after the Karolinska IPTER but with certain differences.

The Danderyd IPTER exists as of yet only in the medical section of the ER. At the time of writing there have been no published articles or studies. This short introduction is based on my own visit, during which I had a short interview with Anne Grünefelt, resident (ST-läkare) in internal medicine and director of the Danderyd IPTER during the fall of 2010.

The student team consists of 3 medical students and 2 nursing students, supervised by a nurse and a physician, the latter being for the most part a resident in cardiology or internal medicine. There is only one shift, from 08:00 to 16:30. As at Karolinska, the IPTER has rooms allocated specifically to their patients, and the team has their own room with computers. The students do a one-week rotation.

The patient screening process is clearly defined. Criteria for exclusion from being treated via the IPTER include impaired cognitive abilities (dementia etc), severe multimorbidity, severe anxiety, and a triage score above yellow, meaning that the patient needs to see a physician within 30 minutes. Examples of symptoms treated via the IPTER include headaches, chest pain, DVT, vertigo. The patients are selected by the triage nurse in communication with the supervising nurse. The supervising nurse then judges from patient to patient whether or not they are suitable to be treated by the students. The patients receive some special considerations such as coffee and snacks, but are not treated preferentially in any way otherwise.

The flow chart is similar to that of the Karolinska IPTER, with great emphasis being put on students independently seeing the patients and discussing amongst themselves before consulting the supervisors. Structured feedback is provided, often during the morning hours when there are fewer patients at the ER.
The medical students manage 2-3 patients per student per day, meaning that the supervising physician has treated 6-9 patients per day, similar to Karolinska. The patients treated through the IPTER are exempt from the Swedish standard 4-hour rule (that the management of each ER patient should take a maximum of four hours). However, this goal is fulfilled for the most part, and the majority of patients are discharged or admitted within the allotted time.

The task of supervising physician is rotates and is part of the regular ER duties performed by all residents in internal medicine. As at Karolinska, the supervisors do not treat patients other than those managed through the IPTER. This is held up as beneficial, allowing the supervisors to concentrate on the students and not feel torn between the dual tasks of supervising students and managing patients, as is often the case at regular university hospital ER:s. The role of nurse supervisor is split between two nurses, both clinical teachers (Swedish: klinisk adjunkt) at the Sophiahemmet Nursing School. When not teaching or supervising students they work regular shifts in the Danderyd ER. The IPTER at Danderyd is financed in part by the Karolinska Institute, which has the overall responsibility for the medical students’ education.

There have been no studies done on patient satisfaction at Danderyd, but the overall impressions of students and supervisors alike is that the patients are satisfied with the care they receive, in particular the time the students have available to inform the patients and discuss health related aspects such as medication.

Discussion concerning the IPTER concept

As we have seen, the IPTERs at Karolinska and Danderyd are very similar. The main difference is the supervising physician. At Karolinska, the supervising physician, particularly in the orthopaedic and surgical IPTERs, is usually a senior physician, meaning that the patients are predominantly managed without the need of specific consults. At Danderyd, the supervising physician is a fairly experienced resident (ST-läkare), meaning that he or she for the most part works independently but still with the occasional discussion with a more senior colleague or consult. At Danderyd all such consults, usually in the form of a short telephone call, are performed by the students.

This provides vital training in an activity that junior doctors have frequent need for – consulting a senior physician, presenting relevant medical facts about the patient, formulating the right questions and receiving instructions that allow the management of the patient to continue.

While this happens naturally in every case managed through an IPTER, consulting a supervisor who is present at all times – devoting his or her time exclusively to the students’ patients – is fundamentally different from consulting the on-call neurologist, for example. Likewise, it is my personal opinion that, while it is of great value for students to have senior physicians as instructors
and tutors, there is something to be said for having a supervisor whose career is at most 10 years ahead of that of the student. Additionally, if the supervisors are residents rather than attendings, the cost is substantially lower.

As we see in the above examples, supervising students does not remove the physicians and nurses from managing patients. At most, the number of patients managed is lowered if the physician is managing them via the IPTER. As has been mentioned, managing upwards of 9 patients per 8-hour shift does not compare unfavourably with the number handled by a regular physician working in the ER.

In neither of the IPTERs are the patients informed specifically that they will be treated by students. The overall impression is that this arrangement works out well, with very few patients refusing to be seen by students. At teaching hospitals in Sweden, students on clinical rotations regularly participate in patient care unless the patient specifically requests not to be treated by students. Thus, there is no great difference in this regard for the patients.

As there are no published studies that I am aware of, the evidence base regarding the educational effects or the IPTER is at the moment non-existent. The reported student satisfaction with the course is valuable, as is the high patient satisfaction. Additionally, the cost of supervisors and premises is in some part offset by students reducing the ER workload through managing patients.

**IPTER vs IPTW**

The concepts of these two different interprofessional clinical courses differ to a not-insignificant degree. As we have seen, the IPTWs require the students to care for the patients as a team, regardless of future profession. A substantial part of the day is spent on performing tasks that would normally fall within the domain of the nurse assistants. The teams lack profession-specific supervisors for all other students than nursing students at least half the time, given that physicians as well as OT and PT supervisors only work the day shifts. While surely providing an education in basic patient care, teamwork and communication, the medical students’ education in orthopaedics is in some ways compromised, if nothing else then by the simple fact that two out of four weeks are spent in a ward. Orthopaedics being a surgical specialty with a high percentage of patients being admitted through the ER, it is of particular concern that medical students receive a sound education in basic emergency orthopaedics.

The decision to place the IPTWs in orthopaedic wards is related to two things: tradition and the multi-professional teams involved in caring for such patients. On the other hand, a geriatrics ward, for instance, holds many of the same challenges and employs, in many cases, teams consisting of the same professions. Additionally, if the course in IPE takes place within a course in geriatrics, the
medical students need not feel that they are deprived of opportunity to practice specific clinical skills or attend operations. It is hard to escape the fact that the two weeks the medical students spend at the orthopaedic IPTWs exposes them only to a small part of what is encompassed by the discipline of orthopaedics.

In contrast, the IPTERs have the students performing profession-specific tasks only. It can be argued that the emphasis on teamwork is less, since the students see the patients one at a time and work side-by-side rather than together. At the same time, the IPTER provides the students with an excellent opportunity in realistic teamwork, as the organisation employed is the same as that of many ER:s in Sweden, though the teambased model is becoming more prevalent.

**Study design**

This study is a qualitative study using methodological triangulation with observations, interviews and focus groups together with extensive literature review. The different parts – a search into the literature, the visits to various IPE-projects, opinions collected during the pilot, and focus group sessions with the students participating in the pilot – are described in detail below.

**Literature study**

As part of this project, a librarian specialised in searching the medical literature performed three separate searches into medical and educational databases. The MESH-terms interprofessional education, students, emergency department, or variations there-of, failed to find any articles or studies similar to the IPTER project. Searches found several articles and studies concerning so-called “Free clinics” in the USA, where medical students under supervision provide medical aid to disenfranchised populations. For several reasons, the results from such studies are not readily applicable to the IPTER project, chiefly because of the different settings and patient groups.

As has been reviewed in this paper, the IPTWs are the most commonly applied form of IPE in the curricula of Swedish medical schools. As described above, much of the research into medical education in Sweden is done in the context of the IPTWs.
Visits to various IPE projects

The first step towards creating an IPTER at Uppsala University Hospital (UUH) was taken in the fall of 2010. Different IPE-projects in Sweden, particularly the IPTWs in Enköping and Västerås, as well as the IPTERs at Danderyd and Karolinska were visited. Observations, interviews and more informal discussions were performed. Supervisors and students were interviewed, and the practicalities involved in treating authentic patients in an educational environment were discussed in detail. In particular, the Danderyd and Karolinska IPTERs provided a helpful blueprint from which the pilot project was planned. From these visits, a model was constructed for how the IPTER at UUH would be organised.

The visits to the IPTWs and IPTERs provided much needed insights into the organisation and management of the project. The process of selecting patients differs markedly between the projects, yielding various challenges and benefits for students and supervisors alike. The Enköping and Västerås IPTWs differ in this regard, with the Enköping ward exclusively treating comparably healthy patients admitted to undergo elective joint replacement surgery, the vast majority being hip or knee prosthetic surgery. The Västerås ward, on the other hand, is an orthopaedic emergency ward admitting a wide variety of patients with acute orthopaedic conditions. While diversifying the ailments seen and treated by the students, this approach makes for a challenge in planning the work as the patients vary widely in their respective needs and capabilities. At the Enköping ward the patients are managed according to a flowchart which, barring complications, provides ample opportunity to plan the process and secure a steady flow of patients.

The organisation of the Karolinska and Danderyd IPTERs has been described in detail above.

The organisation of the UUH ER

The UUH ER patients are assessed either in the trauma room (used for all patients arriving by ambulance or whose condition may be critical; not just trauma patients) or in the examination rooms. They are either admitted by ambulance or by the waiting room.

Setting up the IPTER pilot

For the pilot, the medical students participating are in their fifth semester, being the first clinical semester, and indeed their first clinical rotation. The IPTER course is given as part of the 4-week course in Emergency Medicine I. During the first week, the students are in the Clinical Skills Centre, learning the basics of acute management of patients and undergoing basic training in ATLS (Advanced Trauma Life Support). After this, students spend three weeks in different parts of the ED, such as the Emergency Ward and the ER, chiefly seeing and examining patients seeking the ER
for medical complaints. Clinical rotations in orthopaedic, surgical, gynaecological, psychiatric and paediatric emergency medicine take place during the respective courses, all of which are given later in the curriculum. Due to the limitations of UUH half of the students attend their clinical rotation in emergency medicine in various regional hospitals, meaning that the medical ER and ER ward of UUH is attended by circa 45 students divided into three groups per semester.

The original goal was to have the project up and running in December 2010. This proved impossible due to logistical reasons and the schedules of the various participants. Instead, a pilot was decided to start on the 1st of March 2011. Due to a shortage of space in the ER, it was decided to only operate the IPTER from 08:00 to 12:00, when there are rooms available for students and patients alike. After a one-hour lunch break, the team gathered again and went over the patients seen during the shift – discussing differential diagnoses, giving structured feedback on teamwork, communication, clinical skills etc. For the pilot, only patients at the medical section of the ER were included, as the courses in general surgery and orthopaedics are given in the 6th and 7th semester, respectively.

The role of supervising physician is fulfilled by Martin Wohlin, specialist in internal medicine, and director of the Unit for Medical Education at Uppsala University Medical School, as well as the supervisor on this paper. The role of nurse supervisors is fulfilled by Anette Wennerholm and Birgitta Ekbom. I was present through-out the pilot as facilitator and occasional supervisor, answering questions from the students and observing the pilot as it developed. Focus group sessions were held one week after the pilot.

All of the supervisors work at the IPTER as additions to the work force present – none of the regular physicians or nurses were diverted to supervise the students. This was deemed important for the pilot, as it ensured that any logistical or practical problems encountered with the organisational model did not lead to increased workload for the regular staff at the ER. For the same reasons, it was decided that management of all IPTER-patients would be completed by the supervising physician, to minimise work overflowing to the regular staff in the ER.

Initially, the plan was to include nursing students in the pilot. Regrettably, this proved impossible due to scheduling difficulties. As several other authors have commented, there are many logistical and practical challenges in synchronising courses and clinical rotations to enable students from different programs and faculties to participate in IPE projects (Sternas et al, 1999).

In the end, the decision was made to start the pilot with medical students as the sole student category present. Otherwise, the project in many ways follows the flow chart of the Stockholm IPTERs, with the nurses fulfilling the role originally intended for the nursing students. Hopefully,
when the IPTER is fully implemented, it will be possible to include nursing students as well. For the sake of continuity, I continue to use the term “IPTER” to describe the project.

The medical students were selected by simple comfort selection: the three medical students scheduled for clinical duty in the ER during the morning shift participated in the project instead of following individual ER teams.

The process of patient selection was fairly strict, with criteria similar to Danderyd IPTER determining whether or not a patient was suitable for the IPTER. They included not having significant cognitive impairments and a triage score signifying that the patients could wait up to an hour before seeing the physician. The criteria are included as Appendix 3. The patients were in some cases first assessed in the trauma room, often after arriving by ambulance, and were triaged to the IPTER after this assessment. Other patients were admitted from the waiting room and were triaged by the IPTER nurses.

The flow chart for the pilot project underwent several modifications as the pilot progressed. The first and final versions are included in the appendix. In short, the nurse together with the ER coordinator and the treating physician are responsible for selecting patients suitable for the IPTER. After this, the nurse sees the patient, taking a short history, vitals and blood samples, while the medical student reads up on the patients past medical records. The medical student then sees the patient, taking a full history and performing a physical examination, after which he or she discusses the findings with the nurse or directly with the physician. After discussing differential diagnoses and relevant lab tests the physician, together with the medical student, sees the patient, with the physician repeating relevant examinations or clarifying the history as needed.

The medical student then writes referrals for radiological examinations, calls consults, and carries out the paperwork necessary for admitting or discharging the patient, as appropriate.

The pilot was evaluated in several ways. The opinions of the patients were recorded through informal interviews by the nurses. The students evaluated the project by focus group discussions and through the daily discussions and feedback session.

The regular staff at the ER was informed on several occasions, to ensure that everyone was aware of the pilot and knew to direct suitable patients to the IPTER. A small brochure detailing the specifics of the project was produced and distributed in the recreation room.

After each day, the process was evaluated and discussed amongst the supervisors and the students. Later, the students were interviewed individually to give their impressions of the IPTER and to find areas of improvement. The themes recurring in these individual interviews were then brought up in the focus group, in order to deepen the discussion and to provide an opportunity for the students to
engage in an open discussion with each other.

After the pilot, the supervising physician and nurses has continued to run an IPTER team when possible.

The main goal of the pilot was to find a workable model for the IPTER at UUH, with much effort being put into identifying problems and trying to work around them. Several questions were posed at the start of the project:

What is the best model for managing patients through the IPTER?

What are the capabilities and limitations of the medical students concerning their clinical skills and knowledge?

Is there a sufficient flow of patients suitable to be managed through the IPTER?

What are the attitudes of the patients towards being seen primarily by medical students?

**Results**

The pilot took place March 1\textsuperscript{st} – March 4\textsuperscript{th}, with the team working a 08:00-12:00 shift. When the medical students were not occupied with patients treated through the IPTER, they were free to rotate in the trauma room or with the other ER-teams. Below follows a day-by-day report of the pilot, with notations on what was said during the feedback sessions and what patients were managed through the IPTER. The comments made by the participants are then expanded upon in the focus group session. For the majority of patients, the supervising physician saw the patients first, introducing himself and informing the patients that he was their treating physician and that a medical student would see them shortly.

**Observations**

**Day 1**

For the first day, there were initially no suitable patients available until 10:00, when the first two patients were assessed via the IPTER.

Patient 1: 40-year old female, presenting with chest pain and shortness of breath. Past medical history includes extensive workup for possible reumatological disorder. She was admitted to the ER by ambulance having felt chest pain during a meeting. ECG and physical examination revealed no signs of ischemic heart disease or any other condition. Initial lab results showed a sodium level of 103 mmol/L – subsequent tests showed normal electrolytes. Due to the 1-2 hour lag in getting lab results the supervising physician returned to the ER in the afternoon and completed management of
the patient, in this case discharging the patient.

Patient 2: 43-year old female presenting with painful and swollen calf, suggesting possible DVT. D-dimer was elevated. Patient was treated according to protocol, receiving a subcutaneous injection of 4000E LMWH and being scheduled for an ultrasound the following morning.

Even with one patient needing repeated lab results, management of both patients was completed within four hours of admission.

During the following feed-back session, the team discussed the process and found areas of improvement. Initially, blood samples were collected after a discussion with the students, in order to facilitate the learning and to activate the students’ thought process concerning which samples were appropriate and how the management of the patient would change depending on the lab results. However, considering that the 1-2 time delay between taking samples and receiving results, it was decided to speed this process as much as possible in order to complete the management of the patients within the four hours that the IPTER operated. The nurse and supervising physician and the nurses decided what samples to take based on the complaints of the patient. The supervising physician invited the student to consider relevant lab analyses for the patient, thus speeding the process while maintaining a learning situation.

The premises from which the IPTER operated consist of two exam rooms for patients and one cubicle with two computers. With upwards of seven people in the team, the space soon became inadequate. This was reported as detrimental to the team as it complicated team-communication and following the flowchart. The medical records contributed to by the students were printed and critiqued the following day, prompting a discussion on what terms to use and what examinations are relevant for the patient.

The nurses suggested that the medical students take ECG:s and perform phlebotomy as part of their patient management. While this would usually be performed by nurses or nurse assistants, it was decided that the medical students would perform the tasks as time allowed, in order to maximise the learning experience as relating to the management of each patient.

Day 2

Two of the medical students took one patient each almost immediately with the third following up on the patient from the day before by being present for the ultrasound. Blood samples were collected immediately as part of the nurses’ assessment of the patients. The medical students took ECG:s as needed.

Patient 3: 30-year old male presenting with recurrent atrial fibrillation, having undergone
electroconversion twice in the past year. The patient was under treatment with Warfarin and was fasting. This patient proved immensely suitable for management through the IPTER. The medical student read the ECG, performed a physical examination and history, discussing relevant lab results with the supervising physician, culminating in the medical student calling the on-call cardiologist who came to the IPTER. With the supervising physician present, the medical student then presented the case to the cardiologist, providing relevant information and ultimately admitting the patient to the arrhythmia ward for electroconversion. The management of the patient took less than two hours.

Patient 4: 45-year old male presenting with chest pain, having undergone percutaneous mitral valve surgery at a separate university hospital two weeks ago. Past medical history included chronic back and neck pain. Patient was somewhat dissatisfied with previous medical contacts. This patient also required a consult from the cardiologist, again carried out almost exclusively by the medical student. With lab results negative, the patient was discharged and scheduled for an ultrasound the following morning to assess the function of the mitral valve. The management of this patient was concluded in well under four hours.

Having successfully managed two patients presenting with cardiological histories and complaints within the time allotted, it was concluded that patients presenting with atrial fibrillation and patients presenting with non-specific chest pains are suited for treatment via the IPTER. The need for cardiological consults gives ample room for students to receive training in presenting a case to a consult and ascertaining that correct information is given and received. This is one example of the benefit in having a supervising physician who is not an attending, as most attending physicians would be able to manage this patient group without consults, resulting in less opportunity for the students to practice presenting patients. The possibility of a fast-track system for patients with atrial fibrillation via the IPTER will be evaluated further.

The ER coordinator was most helpful, keeping track of patients seeking medical aid and directing those appropriate to the IPTER.

The day was concluded with a group discussion. The medical student not taking a patient today had instead followed the patient from yesterday to the ultrasound, which was negative, prompting a short discussion on managing patients with suspected DVT:s. Seeing the management of the patient from start to finish was reported by the student as beneficial.

Overall the supervising physician, the nurses and myself were impressed by the students' capabilities in handling consults and discussing the patients. Earlier fears concerning the students' lack of clinical experience were put to rest, as the students had proved themselves capable of independently examining patients and taking consults, with supervision as needed.
Day 3

All three students had one patient each before 0845. This required borrowing one patient room from the surgical ER-team.

Patient 5: 87-year old female presenting with unresponsiveness and deterioration in mental condition. Past medical history includes two separate CVI consisting of one ischemic stroke in the left corona radiata and a small haemorrhage in the right thalamus, as well as several severe depressions. This patient was initially assessed by the physician working the night shift, having been admitted in the early hours. While not an ideal patient for the IPTER (considering cognitive impairments and history of mental illness), the patient none-the-less provided a challenge for the student who performed a full neurological examination and history as the patient’s condition allowed. Before seeing the patient, the student and I reviewed the medical records, discussing what aspects of the neurological exam were most important and what sequelae were to be expected from past CVI:s. The medical student reported that this initial discussion was very helpful for assessing the patient. The findings from the neurological exam differed from those recorded previously, and the patient was referred for a CT-scan, which came back negative for acute haemorrhages or infarctions. The patient was prescribed antibiotics for a UTI and returned to her assisted living facility.

Patient 6: 69-year old male with atrial fibrillation and pacemaker, presenting with chest pain, duration >48 hours. Patient’s lab results came back negative and the ECG was unchanged compared to previous ones. Patient was waiting for a scheduled electroconversion. A cardiological consult was performed by the medical student and the patient was discharged.

Patient 7: 74-year old male admitted to the ER by ambulance, having collapsed at the auto shop. The patient was initially assessed in the trauma room and was then triaged to the IPTER. Past medical history includes multiple episodes of fainting, Parkinson’s disease, a long history of headaches and vertigo, chronic atrial fibrillation, and unspecified anxiety. The patient expressed dissatisfaction with previous medical care received and had a multitude of complaints additional to the symptoms prompting medical attention. Even so, the medical student successfully took a history and performed a physical examination, after which the medical student and the supervising physician discussed the patient. Lab results and ECG came back negative and the patient was discharged.

Management of all three patients was concluded within four hours, meaning that the physician did not need to return to the ER during the afternoon. All three patients were treated within four hours
of admission to the IPTER: in one case the over-all management took more than four hours given that the patient was initially admitted and assessed by the night-shift physician.

During the concluding discussion, one of the students reported feeling overwhelmed during history-taking, with patients bringing up various complaints, some of which related only tangentially to the medical situation that had prompted them to seek medical aid. This resulted in a short coaching in various techniques that can be used to help patients focus on the present situation. The students also expressed a need for a short briefing with the physician prior to examining the patients, to ensure that relevant parts of the physical examination were not missed and to ensure that vital parts of the history were probed. This resulted in new instructions to the students – to present the known facts about the patient’s acute condition as well as relevant parts of the medical records to the supervising physician or nurse prior to seeing the patient. The student made suggestions as to what parts of the examination were of particular importance and the physician would complement the student’s suggestions as needed.

Management of the patient with the suspected CVI took almost three hours for the medical student, during which time the student was rarely unoccupied. Reading up on the patient’s extensive medical records took some 30 minutes, taking a full history and performing an extensive neurological exam took the better part of an hour, discussing the case with the physician took some 25 minutes, assessment of the patient by the physician took 10 minutes. After the negative CT-scan, writing the discharge note for the patient took the better part of an hour. This instructive case shows that medical students can manage similar patients within four hours, but only if the patients are admitted early during the morning shift. If there are no other suitable patients, this example also showed that the IPTER can complete management of patients taken over from the night shift physician.

The day was considered a success: all of the students had managed one patient from start to finish in less than four hours, relieving the supervising physician and the nurses of the task of visiting the ER in the afternoon to complete treatment and management of any patients.

Day 4

Three patients had been admitted to the IPTER before 09:00. In line with the students’ suggestions, a short briefing session was held with the supervising physician before they examined each patient.

Patient 8: 30-year old male with atrial fibrillation, previously admitted to the hospital via the IPTER (see patient 3 above). The patient had undergone successful electroconversion the day before; unfortunately he now returned to the ER with atrial fibrillation. The same student saw the patient this time. The cardiology consult was not available – instead, the student communicated directly
with the patient’s treating cardiologist and admitted the patient to the arrhythmia ward for further treatment. Management of the patient took less than 2 hours.

Patient 9: 66-year old female presenting with heart palpitations and shortness of breath. Patient had a history of asthma and heart palpitations but no known ischemic heart disease or heart failure. Previous medications included metoprolol, which was detrimental to the patient’s asthma condition, prompting a switch in medications a few days previously. Physical examination showed no signs of cardiac or pulmonary disease. ECG was unchanged compared to previous tests and lab results came back negative. Patient was informed that the heart palpitations were likely due to the phasing out of metoprolol and was recommended to keep with the dose-escalation schedule prescribed for the new medication. After seeing the supervising physician the patient was discharged. Student commented that the briefing before seeing the patient helped in taking a relevant history. Management of the patient took under three hours.

Patient 10: 85-year old female admitted to the ER from an assisted living facility, presenting with somnolence and unresponsiveness. Patient had undergone hip replacement surgery after falling and sustaining a hip fracture two weeks previously, and had been discharged from the orthopaedic ward two days previously. Past medical history included depressions and epilepsy (including a status epilepticus two years previously that required treatment at the NICU). Despite the complexity of the case, the student assessed the patient and admitted her to the ER ward, where the student presented the patient to the ward nurse under supervision of the IPTER nurse. Cause of patient’s altered mental state was judged by the supervising physician as a possible side effect of pain medications. The management of this patient required great attention by the supervising physician due to the patient's history. While management of one such patient was possible, the resources of the IPTER may have been strained should two such patients be triaged simultaneously to the IPTER. The patient was managed in less than four hours. The student commented that the IPTER nurse was a necessary backup as he reported the patient to the ER ward.

Patient 11: 33-year old female presenting with chest pains. Past medical history included work-up for suspected rheumatological disease and episodes of anaemia following a caesarean section. Further probing by the medical student revealed that the patient’s pain was located in the epigastric area rather than the chest, and that the pain came in severe, cramp-like episodes. ECG and blood tests showed no signs of infection, heart disease or heart failure; however, elevated liver enzymes were present. A surgeon and a rheumatologist were consulted. The patient was ultimately discharged after being scheduled for an ultrasound of the gallbladder. Management of this patient took over four hours due to the need for repeated lab tests and consults.
In the concluding discussion and feed-back session, the students’ commented that they were initially unclear on what had been done with the patients prior to their assessment. The nurses commented that the students would have a greater understanding of the process through which the patients are managed and assessed if they, on their first day, followed one of the nurses, gaining first-hand experience on what the nurses’ assessment entails. The suggestion was echoed by the students. The system with briefing sessions prior to examining the patients, where the students would suggest particular points of interest in the history and physical examination, was deemed a great help by all three students.

Several of the participants also felt that the small premises through which the IPTER operates made it difficult to communicate in the team. In particular, the supervising physician was sometimes hard to locate. Ideally, the premises should be large enough for the entire team, facilitating discussions and making it easier to follow the flow chart.

**Summary of the pilot**

For the first four days of operation, the IPTER managed 11 patients from start to finish. This was accomplished during 4 hours of operation each day, meaning that the IPTER managed 0.7 patients per hour, not including the extra time spent managing the two patients who could not be processed within the four-hour time range. For the supervising physician, this means that he managed between 2-4 patients per 4-hour shift. It is my estimation that this is a reduction by perhaps 30-40% compared to when the IPTER-physician works a regular morning shift in the ER.

Also, the pilot showed that the IPTER is fully capable of managing the majority of its patients within the four hour time frame. The two cases in which management of the patients was not completed within four hours would likely not have been managed in under four hours had they been treated through the regular ER, as their conditions required repeated blood tests and consultations.

The pilot showed that patients presenting with arrhythmias are supremely suited for management via the IPTER, as many of these patients are to be admitted after consulting with the on-call cardiologist. Patients presenting with non-specific chest pains are also suitable, as the majority of these can be discharged provided that lab results and ECG do not reveal any signs of cardiac disease.

The IPTER also assessed two elderly patients with extensive past medical histories, presenting with symptoms requiring rapid medical assessment, the management of which proved a challenge for medical students attending their first clinical rotation. While not meeting the criteria set forth for inclusion in the pilot, these patients were assessed and managed within the timeframe, giving the
students valuable experience in the particulars of treating a common type of patient seen in the medical ER.

Opinions of patients were informally taken by the nurses. No patient expressed any adverse feelings towards being examined by medical students before seeing the supervising physician.

**Focus group session**

The focus group consisted of six medical students, three students who participated in the pilot and three students who participated in the IPTER the week after the pilot. At the time of the focus group all of the students had attended rotations other than the IPTER, thus having points of comparison.

**General impressions**

The students felt comfortable with seeing patients independently. One student commented that it felt “like a natural progression from PU”, PU being short for “Professionell utveckling” (Professional development) the preparatory course running through-out the pre-clinical years providing training in history-taking and physical examination. Other student comments stressed the value of having time to read up on the patient’s history to give further background to the patient’s present complaint. Also, several students commented that the generous time given with each patient was beneficial, as this allowed students to take full histories and examine the patient at their own pace without feeling pressed for time.

There was a consensus among the students that seeing the patients independently of the supervising physician was positive. Some comments:

”(...) when you enter the room with a doctor you never do [the examination and history] by yourself. The patients turn to the physician. It’s better if the physician sees the patient during a second session. That’s how we get to be responsible for the patient and the consultation.”

”It’s better to discuss the patient outside the examination room, what was missed and what can be expanded upon.”

“That way you don’t lose track, you can relax and devote your time to the patient.”

“I think you learn from your mistakes, you exit the room and think ‘Darn, I missed this and that,’ and then you see that it’s obvious and you remember it better.”

”Even at home, I’d sit thinking: ‘I should have thought of this, and I could have done this’. ”

Several of the students had the opportunity to accompany patients they had referred for further testing, primarily ultrasounds in patients with suspected DVT:s. The opportunity to follow the
patient and see the entire management was appreciated.

Patient flow and workload was deemed appropriate. Managing one or two patients from start to finish kept the students occupied during the shift.

**The patients**

As previously stated, certain patients were regarded as particularly suitable to the IPTER. The students also discussed patients managed through the IPTER despite not meeting the criteria set forth. Concerning the management of one elderly patient, a student commented:

“There was a lot to read up on, and I couldn’t perform a full examination [due to the patient’s condition], but it was rewarding as well, trying to figure out what caused [patient’s deterioration]. It wasn’t acute in a way that made me feel uncomfortable.”

Another student managed a patient initially complaining of chest pains, who was ultimately referred to the psychiatric ER for assessment.

"Initially the patient complained of palpitations, vertigo and anxiety. She was worried about a birth mark on her leg, worried that it was cancer. I probably spent 40 minutes with her, at the end of the consultation she mentioned that she had had a post partum psychosis previously. [The supervising physician] was a great help there, I was confused mostly. All in all it was very educational."

**Taking consults**

Several of the students took consults from on-call specialists, mostly regarding patients with cardiological afflictions.

“I consulted a specialist in infectious disease [regarding a patient with possible herpes-zoster]. I reported the patient according to SBAR, it went well.”

“I consulted the cardiologist several times.”

**Placing ECG:s and taking blood samples**

Some of the students placed ECG-leads. None took blood samples. Opinions were somewhat divided as to the value of performing these tasks.

“It’s less effective. Sometimes you need an hour to read up on a patient. If it’s an easy patient [to manage] you can take the blood samples and then [admit them]. With the more complicated patients taking 20 minutes to do that on top of everything else means that it would take even more time.”
“We could choose for ourselves, depending on if we feel the need to practice [placing an ECG and taking blood samples] or not.”

**How can the project be improved?**

Due to the small rooms used, the supervising physician frequently had to find a secluded room in which to hear a student’s report on a patient and to discuss the patient’s management. This meant that the students sometimes had to look around before locating the supervising physician.

“I missed not knowing where the supervising physician was sometimes. Give him a cell phone, or have him always be at the same place.”

While considered educational, it was difficult to enter the trauma room late in the morning shift and still be included in the work done there.

“It’s difficult to get in and introduce yourself when everybody’s busy. It’s probably better to be there early.”

“It helps if [the staff in the trauma room] knows that we want to be active and do things.”

“We could be introduced [to the staff in the trauma room]. ‘We’re in the IPTER, when we’re not there we are happy to this and that here.’ Some members of the staff didn’t know who we were or what we can do. Others activated and included us.”

“Introducing the medical students to the staff so that they know that we’ll be rotating between the IPTER and the trauma room would make it more natural for us to be there.”

Several students felt that there was some initial confusion as to the time allotted for each patient.

“I did not understand at first that managing one patient per day was sufficient. This was clarified as the week progressed.”

“At first I was unsure what was expected of me, what I was supposed to do and how much time I had to do it in.”

Also, students were initially unsure of the process through which the patients were managed; in particular what had been done for the patient prior to the students’ assessment. The flow-chart was not followed to any great degree; in particular, the students did not discuss the patients with the nurses prior to consulting with the physician.

“I only discussed the patient with the physician.”
'We need to be more informed how the flow-chart works. Prior to seeing the first patient we need to know what’s going to happen.’

The rather small premises of the project were commented upon. Several students had to interrupt dictation and continue elsewhere, as the team rooms were occupied from 12:00 by regular ER teams. Also, the students felt that there was some crowding around the computers.

“The only negative thing was to move if you needed to finish your dictation after lunch. We need more time.”

“Two computers wasn’t enough for three students, a physician and two nurses.”

**Differences between regular rotations in the ED and the IPTER project**

The students noted several differences between the IPTER and their regular rotations in the ED. In particular, several students commented that supervision and the degree to which the students were activated and included in the management of patients during regular rotations in the ED was heavily dependent on the individual physicians the students followed. One student stated that “It must be said that with a good supervising physician, much the same procedure [as in the IPTER] was followed. When I was in the ER with [name], it was [similar to the IPTER], but for the most part, the physicians did not have the time or inclination to attend to the students that much.”

The above statement was echoed by several students. Some comments regarding rotations in the regular ED:

“The first week I ended up in the surgical ER, where the surgeon already had two medical students. I didn’t do much.”

”Different from day to day. Everything from tailing a doctor to sitting in the team rooms to managing a patient to doing nothing, not having a supervisor and ending up reading my book instead.”

“I only observed in the trauma room.”

“The nurses at the IPTER were great, really helpful very interested in us.”

Three of the students stated that they had not been involved in assessing the patients when rotating in the trauma room. However, there were exceptions:

”I got to do a lot, maybe because I was more forward. I was present for a trauma code, helping to lift and move the patient and remove clothing etc. But I spent more time in the trauma room [than the other students], so that matters.”

“I was involved in the discussions, there was time for that. They [the staff in the trauma room] took
an interest in that regard, even if I didn’t do much.”

Having continuous access to the supervising physician and the nurses, and the structured feedback sessions were stressed as important. Some comments:

"The feedback is pretty much the best part [of the IPTER], to review the patient notes [written by the students] and be critiqued."

"The biggest difference [between regular rotations and the IPTER] is that you have time for questions before seeing the patient and being able to ask questions during assessment of the patient. Also there is time afterwards for questions. On regular rotations, the supervising physician takes a report and sees the patient and that’s that. There’s no room for feedback and discussions.”
Discussion

In many regards, the pilot project was successful. There was a sufficient number of patients suitable for management through the IPTER, and management of the patients was for the most part completed in under four hours.

The students appreciated being able to take their time with the patients without feeling stressed. The feedback sessions at the end of each day were considered very important, indeed singled out as one of the best things with the IPTER compared to regular rotations. The students’ medical knowledge and clinical competence was deemed sufficient for successful participation in the project, both by the supervising physician, the nurses and by the students themselves.

How the IPTER project is to be financed is a question not yet answered. In order for the project to become an integrated part of the ER, it would be necessary for it to not strain the resources of the ER. Hopefully, an arrangement can be made that will allow the IPTER project to continue.

Areas of improvement mostly concerned the information given before the students started their rotation. In particular, the flowchart and organization of the IPTER must be presented in detail to the students. While we attempted to thoroughly inform the students, it seems that there is much improvement to be made in this area. Likewise, far from every student has an understanding of how the ED works. This need for basic information will most likely be smaller for students rotating in the ER later in the semester. In the focus group, the students also expressed a need for a more specific description of what was expected of them.

It became apparent in the interviews that the flowchart had not played a great part in the management of the patients. Had nursing students been present for the pilot, a greater adherence to the flowchart would most likely have been stressed by nurses and physicians alike. As it was, the nurses were helpful and provided tips to the students, but the more structured, sequenced discussions envisioned in the flowchart failed to materialize.

For the pilot, the decision was made to forego more empirical and quantitative approaches in order to focus on a qualitative assessment of the project. If, as we hope, the IPTER becomes a permanent fixture in the UUH ER, further studies are invaluable in assessing the opinions of the students and the educational value of the rotation. Most likely, a combination of quantitative and qualitative studies is required to evaluate the project with a sufficiently high degree of complexity.

It would be most interesting to conduct follow-up studies some years later, when students participating in the IPTER are practicing physicians. What are their memories from the IPTER? How has it influenced them, if indeed it has influenced them?
Plans are in place to allow students in their 11th semester attend the IPTER – this would give an ideal point of comparison, as the students’ evaluation from their 5th semester rotation can be compared to their 11th semester evaluation. Also, returning to the IPTER could potentially allow the students to note and reflect their own professional growth during the intervening years.

As has been noted previously, organizing different undergraduate programs in such a way that the schedules allow the students to be present for IPE projects is a challenge. For the pilot, it proved impossible to include nursing students. However, given that nursing students and medical students at UU can attend the IPTWs together, it is likely that an arrangement can be made to allow them to attend the IPTER together as well. Other possibilities are including nursing students studying elsewhere, such as Stockholm and Västerås, both within comfortable commuting distance.

Should the IPTER expand to include nursing students, the effects of this early exposure to IPE must be researched. Points of interest include the degree to which the students’ knowledge of their respective professional roles and that of their co-students, how cooperation in the student team changed during the week, and the enduring effect of this short session in IPE, if any.

As has already been noted, I have been unable to find any published articles from the various IPTER projects in Sweden, which strikes me as rather glaring deficit in the field of literature in medical education. In particular, the Karolinska IPTER has most likely amassed a vast amount of data on student opinions and evaluations during its 12 years of existence. In a pithy phrase, this data is a doctoral dissertation waiting to happen.

The IPTWs, on the other hand, have been fairly extensively researched. As this is the most common form of IPE that Swedish undergraduates in health sciences are exposed to, it would be of great interest to compare results from future studies on the IPTERs with those obtained from studies on the IPTWs. In particular for the medical students, the time spent on profession-specific tasks in the IPTER is greater than that of the IPTW. Likewise, the amount of time that the students have profession-specific supervision differs greatly between these two different IPE projects.

Investigating the effects of these two variables would give a greater understanding as to which parameters are of importance for students on clinical rotations.

Additionally, many medical students at Karolinska and Danderyd – and in the future also at Uppsala – will graduate medical school with experience both from the IPTER and the IPTW. While the students attend the different projects at different stages of their education, this group of students nonetheless provides an excellent opportunity for comparisons between these two different forms of IPE. Which is preferred by the students? How to the experiences differ? What is the difference in knowledge gained concerning teamwork and clinical skills?
Further work is needed to determine the most efficient organization of the IPTER. For the pilot, the supervising physician was a specialist in internal medicine. As stated previously, it is my personal belief that there are several advantages to having a supervisor whose career is not too far ahead of one’s own. In addition to the economic advantages – using senior physicians as supervisors is far more costly – a younger doctor was in the students’ position just some few years ago. This closeness in perspective is, I believe, advantageous when supervising medical students. In my own personal experience, some of my best supervisors have been younger doctors and in some cases newly graduated physicians.

The cost of the project must also be related to the actual work being done – patients being managed who otherwise would have been managed through the regular ER. Thus, it would be most interesting to see a comparison between the number of patients managed by the supervising physician via the IPTER and a physician working a regular team. Recognising that the medical students together with the physician and nurse are contributing to the work done at the ER would go a long way to make the IPTER a natural, integrated part of the ED.

In summary, there is a wealth of interesting studies to be done in the future. Hopefully, there will be ample opportunity to perform these studies, and further the cause of making education evidence-based.
Appendix 1

Flowchart 1.1 for the UUH IPTER pilot:

A patient is triaged to the IPTER

- Nurse checks vitals, takes a short history, and takes blood samples
- Medical student reads up on patient’s medical records.

Nurse reports the patients’ symptoms and vital signs to the medical student

- Nurse reads up on the patient’s medical records
- Medical student takes a full history and performs a physical examination

Medical student and nurse discuss the patient; initial assessment, differential diagnoses etc

Medical student, nurse and physician decide further management of patient

Medical student writes referrals, takes consults, admits or discharges the patient as appropriate
Appendix 1

Flowchart 1.2 for the UUH IPTER pilot:

Nurse and ER coordinator triage patient to IPTER

Nurse checks vitals, takes a short history, and takes blood samples

Consult the physician as needed

Medical student reads up on patient’s medical records.

Nurse reports the patients’ symptoms and vital signs to medical student

Nurse reads up on patient’s medical records

Medical student takes history, performs physical examination

Medical student and nurse discuss the patient; initial assessment, differential diagnoses etc

Medical student, nurse and physician decide further management of patient

Medical student writes referrals, takes consults, admits or discharges the patient as appropriate

Remember to give continuous feedback regarding communication and teamwork!
Appendix 3
Criteria for treatment via the IPTER, translated from Swedish

**Patients suitable for the IPTER**

The goal is for the students to manage, as independently as possible, the most common non-critical patients seeking medical aid at the medical ER. If possible, a mix of different types of patients and complaints is preferred.

**Criteria for management via the IPTER**

- *The nurse together with the ER coordinator and treating physician is responsible for admitting patients to the IPTER*

- Non-critical patients triaged yellow, green or blue
- Not suffering from manifest dementia or other significant cognitive impairments (mild confusion etc is not a criteria for exclusion)
- Not suffering from severe multimorbidity (i.e. repeated strokes with severe sequelae, late-stage kidney failure etc)
- Agitated, angry or otherwise “difficult” patients are not suitable

**Examples**

- Headaches (excluding thunder-clap headaches)
- Suspected DVT
- Atrial fibrillation
- Suspected PE
- Chest pain
- COPD
- Asthma
- Vertigo, dizziness
- Stroke (unless treatment with thrombolytics is considered)

Experience from similar projects suggests that many elderly patients appreciate the extensive histories and examinations performed by the medical students, as well as the slower pace compared to the ER.
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