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# Nurse Timetabling: Linking Research and Practice

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Timetabling of courses within the UK University Sector is extremely challenging due to the number of variables and the complex nature of the constraints associated with the management and planning of teaching sessions and those around institutional resource usage issues. (McCollum 2007 a, b). With students paying up to £9K a year for tuition fees and the Higher Education Funding Council for England (HEFCE) dictating greater transparency and value for money in ensuring funds are used for the intended purposes (<http://www.hefce.ac.uk/finance/>), Higher Education Institutions (HEIs) have been encouraged to focus their strategic objectives in attempting to improve the overall student experience (Lord Brown Report 2009). As part of this focus, the delivery of the Institutional Timetable plays a significant role. The Institutional Timetable can be thought of as the window to which the student views the University and whether this view is positive or negative is reflected in question 13 of the National Student Survey. As results can be seen within the public arena (<http://unistats.direct.gov.uk/>), Universities are realising the importance of delivering quality within the timetable while attempting to continue to make best use of the available resource.

Sheffield Hallam University in the UK is divided into four faculties which is further divided by a number of departments. The Department of Nursing and Midwifery along with the Departments of Social Work, Social Care and Community Studies, Department of Allied Health Professions, Department of Biosciences and Department of Sport all are situated within the Faculty of Health and Wellbeing. The Department of Nursing and Midwifery has approximately 100 academic staff, of which 20% are part-time. In 2009/10 Sheffield Hallam University was the fourth largest University in the UK based on the number of student enrolments. All full-time, undergraduate students receive an individual, on-line timetable. Timetables are maintained in a live environment; meaning that changes to teaching delivery during the academic year, are reflected on the personalised on-line timetables. Of all the subject areas within the University, Nursing is one of the most complex and difficult to schedule. At the January Academic Registers' Council (ARC) Timetabling Practitioners Conference in the UK, Julie Lane held a workshop where a number of

HEIs shared the challenges and constraint commonly faced. The Academic Registers' Council (ARC) Timetabling Practitioners Group is a UK sector group, which has been established to share good practice, and keep abreast of up-to-the-minute changes in legislation which impacts on timetabling, and also provides a network to discuss a broad range of challenges which Timetabling Managers face. The work outlined in this abstract is an extension of this initial investigation into the identified practical issues. Specifically in relation to nurse scheduling, there are external contributing factors laid out by the Department of Health and National Health Service which contribute to constraining the way courses are delivered. Module delivery patterns are complex. Irregular week patterns combined with changing durations for each individual teaching session has a significant impact on the ability to manage resources of staff and space to meet the peaks and troughs of demand throughout the year, and success often hinges on the flexibility and costs of provision. Each module is likely to have a unique set of pedagogic requirements whether this is taking into account the specialisms of academic staff, managing specialist rooms and equipment or the ability to manage peaks and troughs of demand throughout the academic year.

In addressing the issues associated with Nursing timetabling, it is also important to understand the external influences which are a significant driver. Until recently the funding of nursing education has been provided through the Department of Health (DOH), with the commissioning of Higher Education programmes devolved to regional Strategic Health Authorities (SHAs). Numbers of commissions and contracts are agreed between SHAs and HEIs. Nurses' tuition fees are paid for by Strategic Health Authorities and in some cases they are paid a monthly bursary too. However there are a number of key changes which will affect Nurse Education and therefore the associated delivery issues. SHAs will be broken up over the next year ([http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH\\_117353](http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_117353)) and replaced by Local Education and Training Boards (LETBs). These have already been established in regions and are chaired by chief executives of large NHS Trusts. They will commission health courses and greatly influence the NHS workforce. Also nursing is moving to an all graduate profession (currently there is a diploma or degree option). How this will affect commissioning nurse education and ultimately the NHS nursing workforce has not yet been quantified. It may be that fewer nurses are trained; they being the managers of care, and associate practitioners deliver the majority of nursing-type care. Who will train these associate practitioners is not yet clear. These issues along with their influence on the timetable production will be discussed at the conference.

Traditional timetabling follows the academic calendar as defined by each institution. This normally commences late September and finishes May/June and generally consists of two semesters. In contrast, Nursing courses are often delivered all year round and frequently have multiple in-takes of when students commence their studies. Each module of the course will consist of a mixture of classroom based activities, as well as lectures and practical sessions; each with different durations and irregular week patterns. Added to the mix are placements which are controlled by the NHS and IPE (Inter-Professional Education is credit rated and an aspiration of HEIs to successfully deliver. It is recommended internationally, has European quality indicators and is driven by government policy - UK being the most advanced in this respect). All of these factors contribute to peaks and troughs of demand on resources throughout the year. Having initially explored the complexities of what is required; the success to scheduling is the ability of being equipped to manage the resources i.e. staffing and rooms and more importantly specialist rooms. The largest cost to any HEI is wages which therefore dictates that HEIs must maximise the staffing resource. To enhance the student experience in providing added value, there is a key driver to mix and match the specialisms of academic staff and associate them with not just a module but a specific topic within the module which further adds to the levels of complexity to scheduling. Likewise the staff resource itself is likely to fluctuate over the year, whether this is due to managing staff holidays (7 weeks per year), guest speakers, multiple staff required to deliver a single teaching session and perhaps most frustrating for the timetabling practitioner, the lack of information in not knowing the names of staff to associate with teaching activities. The second largest cost to any HEI is associated with running costs of the estate. The balance to maintain a cost efficient estate yet supporting the pedagogic delivery of nursing activities means that there is a driver to maximise efficient use of the estate which is reported through utilisation surveys. For nursing practical sessions, there is a strong need to provide flexible teaching spaces. The impact of this means technical managers have to find solutions to managing equipment. As technology is quickly developed and improved, it is essential that HEIs keep abreast of these developments and invest in the most up to date advances. The cost associated with this often means that purchases are limited and therefore equipment cannot be fixed to a single location. The mix of providing flexible teaching spaces coupled with the need to move equipment from one

location to another based on demand needs, is likely to provide a 'headache' to the technical support manager; who in turn will look to the timetabling practitioner to find a solution.

In summary, external influences significantly restrict the way in which nursing timetables are delivered. External influences coupled with internal pedagogic requirements create peaks and troughs of demand throughout the academic year. Too successfully schedule relies heavily on managing the resources, which in themselves are restricted by financial means. A large number of nursing students are often mature students who have family commitments. To ensure that the student experience is enhanced, the students themselves are looking for a timetable which balances their learning/life balance. This research is aimed at addressing the acknowledged gap which currently exists between research and practice in timetabling research. Specifically the research will allow the description and modeling the real world complexities around academic nurse timetabling in the UK. This work will be compared with the issues raised within the related areas of course timetabling and nurse rostering described in details within the PATAT sponsored 2010 Nurse Rostering Competition Hapeslugh (2010). Once a problem representation drawn from this work is described and made available, work will commence on the development of algorithms that are able to provide workable timetables while maintaining the balance described above.

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