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Abstract

Background: There is increasing concern amongst educators that the provision of recorded lectures may reduce student attendance of live lectures. We therefore sought to determine if the provision of pre-recorded lecture video podcasts (vodcasts) to first year Graduate Entry to Medicine (GEM) students, affected attendance at 21 Physiology lectures within three separate pre-clinical modules.

Methods: Data on lecture attendance, utilisation of vodcasts, and whether vodcasts should replace live lectures were drawn from three surveys conducted in academic years 2014-2015 and 2015-2016 on all first year GEM students in two first year pre-clinical modules where pre-recorded Physiology vodcasts were available for viewing or downloading prior to scheduled live lectures.

Results: A total of 191/214 (89%) students responded to the three surveys, with 84.3% of students attending all 21 lectures in the study. Only 4% of students missed any more than one lecture in each of the three lecture series, with 79% indicating that vodcasts should not replace lectures.

Conclusion: Therefore, we conclude that the attendance of pre-clinical GEM students at live lectures is not significantly impacted upon by the provision of lecture vodcasts, with most students viewing them as useful revision tools rather than as a replacement for live lectures.

Introduction

The traditional didactic lecture continues to be the most prevalent form of teaching in higher education as a whole and, as such, also for preclinical curricula in the vast majority of medical schools worldwide (Cardall et al. 2008, Jones 2007).

However, the current era of rapid technological advancement has seen the use of various electronic media being used as an alternative, or adjunct, to the traditional lecture format. More specifically, educational institutes are increasingly encouraging the provision of 'enhanced' podcasts (Brown and Green 2007), or VODcasts (where the 'VOD' acronym stands for 'video-on-demand' (Meng 2005)), with synchronised audio and video output, of lecture material. These vodcasts usually take the form either of recorded 'live' lectures or pre-recorded narrated slide presentations of lecture material. Many studies have now clearly demonstrated their popularity with students as, amongst several other factors, students generally perceive that they help to improve their learning (see Kay 2012 for review).

Due to their popularity with students, many medical schools are now also facilitating the recording and on-line storage of 'live' lectures for later review by students. This development means that, purely in terms of information retrieval, students can now miss lectures almost consequence-free as they can view the recorded lectures at their leisure at a later date. Indeed, such is the concern about the possible negative impact upon lecture attendance that the provision of recorded lectures to students online may cause, that many lecturers are actively against such a move (Young 2008). However, in addition to lecturers' instincts for 'self-preservation', there is a concern that a drop in student attendance at lectures may also negatively affect student grades given that lecture attendance is a significant predictor of course performance (Woodfield et al. 2006).

To this end, several groups have empirically assessed this question within non-medical curricula. The majority of these still relatively few studies have found that if attendance was affected at all, then it was only by a relatively small amount of around 5-10% (Brotherton and Abowd 2004, Chandra 2011, Copley 2007, Harpp et al. 2004, Traphagan et al. 2010).

To date however, only two studies have assessed the impact of providing recorded lectures on the attendance of medical students enrolled in traditional 'direct entry' five year undergraduate degree programmes (Billings-Gagliardi and Mazor 2007, Cardall, Krupat and Ulrich 2008), with Cardall et al. (2008), in contrast to the findings of Billings-Gagliardi and Mazor (2007), demonstrating that nearly 30% of pre-clinical medical students did not attend live lectures and instead relied entirely upon the recorded lectures for their study. In addition to this ambiguity about the effect of recorded lectures on direct entry medical student lecture attendance, it is noteworthy that there have as yet been no studies at all investigating their effect on live lecture attendance at live lectures of students enrolled on increasingly popular Graduate Entry to Medicine (GEM) programmes.

These programmes, in addition to requiring students to possess a minimum of a second class honours, grade one (2H1 or equivalent) result in their first honours undergraduate degree (from any discipline), usually span only four, rather than the five or six, years of traditional 'direct-entry' undergraduate medical degrees. This is primarily accomplished by compressing the pre-clinical teaching on GEM programmes into just over one, rather than two, years. As such, students on GEM courses are expected to learn large amounts of material in a much shorter time than their direct entry counterparts which, in turn, requires that they manage their study time very efficiently. Given such time management requirements, the provision of pre-recorded lecture material, which can be played back at 1.5 - 2 times normal speed without any loss of sound quality, may represent a more time-efficient way of studying for some GEM students.

In the present study therefore, we sought to determine if this indeed might be the case by analysing self-reported first year GEM student attendance at 21 Physiology lectures for which full, pre-recorded vodcasts of lecture content were provided online well in advance of each scheduled live lecture.

Methods

The study was undertaken at University College Cork (UCC), Ireland over a thirteen month period between February 2015 and March 2016, utilising two separate cohorts of first year graduate entry to medicine (GEM) students.

At UCC, two preclinical modules, GM1001 (Fundamentals of Medicine I) and GM1002 (Fundamentals of Medicine II), taught over two consecutive three month periods, are comprised of material categorised into six separate disciplines; Anatomy, Biochemistry, Pathology, Microbiology, Pharmacology, and Physiology (note: Biochemistry is not taught in module GM1002).

Of all the contributory disciplines to GM1001 and GM1002 only the author's (M.G.R.) pre-recorded Physiology lectures, or vodcasts, (nine in GM1001 and six in GM1002) were available online (*via* UCC's virtual learning environment, Blackboard Academic Suite (<http://www.blackboard.com>)) for student viewing/download at least two weeks prior to each timetabled live lecture slot. All recorded lectures remained available for download until the end of each academic year.

The pre-recorded Physiology vodcasts were created using Panopto lecture capture software which allowed us to record presentations in a combined audio and visual package with attendant cursor moves. Furthermore, upon playback users can pause, move forward and backward through the content, skip to specific slides, or listen to the presentation at accelerated rates up to twice normal speed. All of the students involved in the study were regularly made aware of the existence of the vodcasts by one of the authors (M.G.R.).

Thus, over the course of the thirteen months (2014-15 and 2015-16) in which the self-reported attendance data used here were gathered (n = 191 responses from 214 eligible students), students were asked to complete an anonymous online survey at the end of each

module containing multiple Likert-style, multiple choice, as well as several free-response, questions relating to their vodcasts usage and attendance. The participants provided their consent to being surveyed when they accessed and completed the survey.

Specifically with regard to lecture attendance by undergraduate medical students, the UCC Book of Modules indicates that it is “required” (see <http://www.ucc.ie/acad/calendar/medicine/med002.html>). However, the author delivering the lectures (M.G.R.) indicated that he generally did not take attendance and that, if he did, it would be for the purposes of academic research, not as a means of catching absentee students. However, M.G.R. also made it clear that whilst the vodcasts contained all of the information that they would be required to know in order to pass the requisite Physiology components of their examinations, the live lectures would not necessarily be a simple regurgitation of the same information.

Analyses

From the data captured by the three surveys we were able to obtain basic demographic information (*e.g.* age, sex, nationality, educational background) and, where relevant, pair this with the information provided in the Likert-type questions. Where we have determined mean values, the standard deviation is displayed in parentheses next to the mean value. A statistical comparison of ages between the males and females in the different cohorts of students involved in this study was conducted using Student’s unpaired t-test (assuming equal variance between the groups).

Results

The data from three different surveys were analysed for the current study; a survey at the end of GM1002 for GEM academic year 2014-2015 (73/73 respondents) and surveys at the end of both GM1001 (53/71 respondents) and GM1002 (65/70 respondents) for GEM academic year 2015-2016, constituting a total of 191/214 (89.7%) students surveyed.

[Table 1 near here]

Table 1 presents demographic data for the respondents and illustrates that there is a roughly even split between males and females (with no significant differences in their ages) and those coming from either an EU state (mainly Ireland) or a non-EU state (mainly Canada). There are however significantly fewer entrants to the GEM program of students whose first degree was classified (by the students themselves) as 'non-biomedical' (*e.g.* law, music, English, *etc.*) relative to those coming from a self-declared 'biomedical' discipline (*e.g.* Biochemistry, Physiology, Nursing, *etc.*).

Of the 191 students who responded to the three surveys, 187 (97.9%) answered the question on lecture attendance. From the analysis we determined that 161 students (84.3%) self-reported attending all 21 lectures included in the study. However, as the survey was anonymous, we were unable to cross reference individual student responses across the three surveys in order to identify which ones had missed lectures. This meant that it was not possible to pool attendance numbers for the three surveys. For this reason, the histograms shown in figure 1 illustrate percentage attendance for all three individual modules/years (figure 1A, B & C). From the histograms one can observe that in excess of 95% of students reported missing only one lecture in each of the three modules (for those lectures which were part of the study), with only three students missing more than one lecture in each module (three students failed to supply an answer in two of the surveys).

[Figure 1 near here]

Although none of the surveys asked specifically about why students would choose to attend or be absent from a lecture, the GM1001 2015-2016 survey did ask if students would prefer vodcasts to lectures (given that the vodcasts contain all of the examinable material that the students are required to know), with the results shown in figure 2. One can observe that only 5/53 students (9.4%) agreed with this statement, with the vast majority (79.2 %) either disagreeing or strongly disagreeing with the idea (11.4% neither agreed nor disagreed). This positive sentiment towards live lectures was, somewhat surprisingly, felt slightly more strongly by those students who entered the course from a biomedical background than those who had entered *via* a non-biomedical route (75.6 % *vs* 66.6% disagreed or strongly disagreed respectively), although, that said, all of the students who agreed with the statement came from biomedical backgrounds (figure 2 B and C).

[Figure 2 near here]

Figures 1 and 2 illustrate that although students knew about the pre-recorded vodcasts that were available to them, they still chose to attend the live lectures. This fact is reflected in students' comments. For example, one student (in the GM1001 15-16 survey) stated that, "...I don't think that the lectures can truly be replaced by podcasts", with another commenting (in the GM1002 14-15 survey) "I don't treat them as a replacement for the actual lectures. I use them for review purposes and I found them extremely useful!! It allowed me to go back on the concepts that I found slightly confusing during class and make further notes, as needed". Indeed, although it was not a specific survey question, the vast majority of the free response comments in the GM1002 14-15 and GM1001 15-16 surveys relating to vodcast usage reflected the fact that most students utilised the vodcasts primarily as a tool for review or revision of the lectures (74 of a total of 106 comments in the two surveys). Sample comments included, (from GM1001 15-16 survey) "I

found the full-length lecture vodcasts to be extremely helpful when reviewing the lecture content especially if I missed something that was said in lecture. Also hearing it for a second time after lecture was very beneficial in retaining key information, especially when being supplemented with the textbook” and (from GM1002 14-15 survey) “It [the vodcasts] is a good review tool that helps to review more difficult material at a pace that is beneficial”. Furthermore, the fact that the students knew that they had the pre-recorded vodcasts to fall back on allowed them to focus fully upon the live lecture content rather than trying to take down copious notes, (from the GM1001 15-16 survey), “Knowing that they [the vodcasts] are available takes pressure off of me during lecture to make sure I take down everything the lecturer says”.

As these and other similar comments indicate that students perceive the vodcasts as being very helpful both for review or preview purposes, it suggests that they can be used by educators as part of an overall means of enriching teaching.

Discussion

The main conclusion of this study suggests that, in line with the majority of previously conducted research into this area with non-medical undergraduates, the provision of recorded lectures to pre-clinical GEM undergraduate students does not significantly affect their attendance at timetabled live lectures, in spite of the speculation that the utilisation of vodcasts as a study aid might have been regarded by some students as a means of increasing the efficiency of a one's study time in preference to live lectures. Indeed, the GEM students surveyed here clearly indicated that they preferred live lectures to recorded vodcasts. These findings also concur with those of Billings-Gagliardi and Mazor (2007) for pre-clinical medical students attending a traditional five year 'direct entry' programme, but is in contrast to those of Cardall et al. (2008) who demonstrated that nearly 30% of students relied entirely upon recorded lectures for their study. We believe the reasons why students decide to attend lectures, even when information-rich, and potentially time saving, alternatives such as online vodcasts are available, can be divided into three main categories which will be discussed below.

1) Content of live lectures and lecturer– As has been discussed in other studies, the actual content of the live lectures plays an important role in whether or not a student decides to attend or not (Billings-Gagliardi and Mazor 2007, Copley 2007). If students perceive that there is no 'added value' to attending a live lecture over watching a recorded one (*i.e.* lectures with no discussion, lectures that are simply lists of facts or that regurgitate, verbatim, the contents of pre-recorded vodcasts) then they will be more inclined to learn in their own time. For the current study, 'value' was added by making lectures more interactive for students in comparison to the rather matter-of-fact vodcast versions by encouraging questions, incorporating interactive quizzes about earlier material and including interesting anecdotes about the material.

2) **Students** – the ‘culture’ of the class(es) in which vodcasts are utilised is also likely to be significant in determining if students attend lectures or not. For example, the GEM students that were the subjects of the current study, as a group are consistently exceptionally motivated and focussed, most likely due to the fact that they, a) are more mature than their fellow undergraduate students who generally enter university degree programs straight from high school, and b) are paying their own relatively substantial tuition fees often after having given up well remunerated, full time jobs to do so. As such, they, not unreasonably, may want to ensure that they are getting their money’s worth by attending all available sessions. Finally, two other factors which may influence live lecture attendance are, a) the concern that if they do not attend classes then they may miss something important not included in the vodcasts and b) the desire to socialise with their classmates, both previously noted by Chandra (2011).

3) **Timetable** – The whole notion that a student may skip a class in order to watch a recorded version of the missed lecture at a later time of their choosing, is contingent upon the student having sufficient free time in which to accommodate this ‘extra’ study. However, programs such as GEM here at UCC, where five years of study for the direct entry medical degree are condensed into four, are extremely compressed and intensive, such that there is already very little time for student self-directed study. Therefore, the students would potentially exacerbate this situation even further by choosing to miss a live lecture in order to watch the vodcast of it at a later date, as also noted by Chandra (2011).

Limitations

The results of this study, and comparisons with other similar studies, must take into account some potential limitations outlined below.

Firstly, the fact that this study was conducted in a single school, with a very specific cohort of students, and was limited only to certain Physiology lectures delivered by one of the authors (M.G.R.), does limit one's ability to generalize its findings to either other undergraduate courses as a whole or, more specifically, to other medical undergraduate programs.

Secondly, although the author, M.G.R., indicated to students involved in the study that lecture attendance would not be recorded (other than for his own records, for the purposes of academic research), the UCC Book of Modules states that attendance at lectures is "required". Because students were not specifically asked why they did or did not attend lectures in any of the study surveys, it is impossible to know how many attended simply because they felt compelled to. However, that said, the author (M.G.R.) has, on rare occasions, witnessed lecture attendance by GEM students fall well below 50% for reasons unrelated to the current study.

Thirdly, as much of the data, particularly for lecture attendance, was self-reported, we cannot be certain that it is 100% accurate. However, this factor can be countered to a certain extent in three ways. First of all, the surveys were all conducted under conditions of guaranteed anonymity, so the students had no incentive to lie about their lecture attendance (although it is still possible that they forgot exactly how many lectures they attended). Secondly, UCC GEM class sizes are relatively small (<75 students), with lectures held in rooms of appropriate seating capacity (*i.e.* <100 seats), so it would have been relatively easy for the author to observe when attendance fell significantly below maximum (*e.g.* <75%). To the best of my recall this did not occur during the study period.

Conflicts of Interest

The authors report no conflicts of interest.

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Table 1

Self-Reported Demographic Data of First Year Graduate Entry to Medicine Students at University College Cork Medical School Who Responded to Three Surveys Conducted Between February 2015 and March 2016*

Demographics	No (%)
Gender	
Male	96 (50.3), average age 24.6 (2.9)
Female	95 (49.7), average age 25.3 (3.9)
Nationality	
EU	92 (48.2), 43 ♂, 49 ♀
Non-EU	98 (51.3), 52 ♂, 46 ♀
Undergraduate degree	
Biomedical	148 (77.5), 71 ♂, 77 ♀
Non-biomedical	40(20.9), 22 ♂, 18 ♀

*Please note that some of the percentages for each grouping do not add up to 100% as not all respondents answered every single demographic-related question.

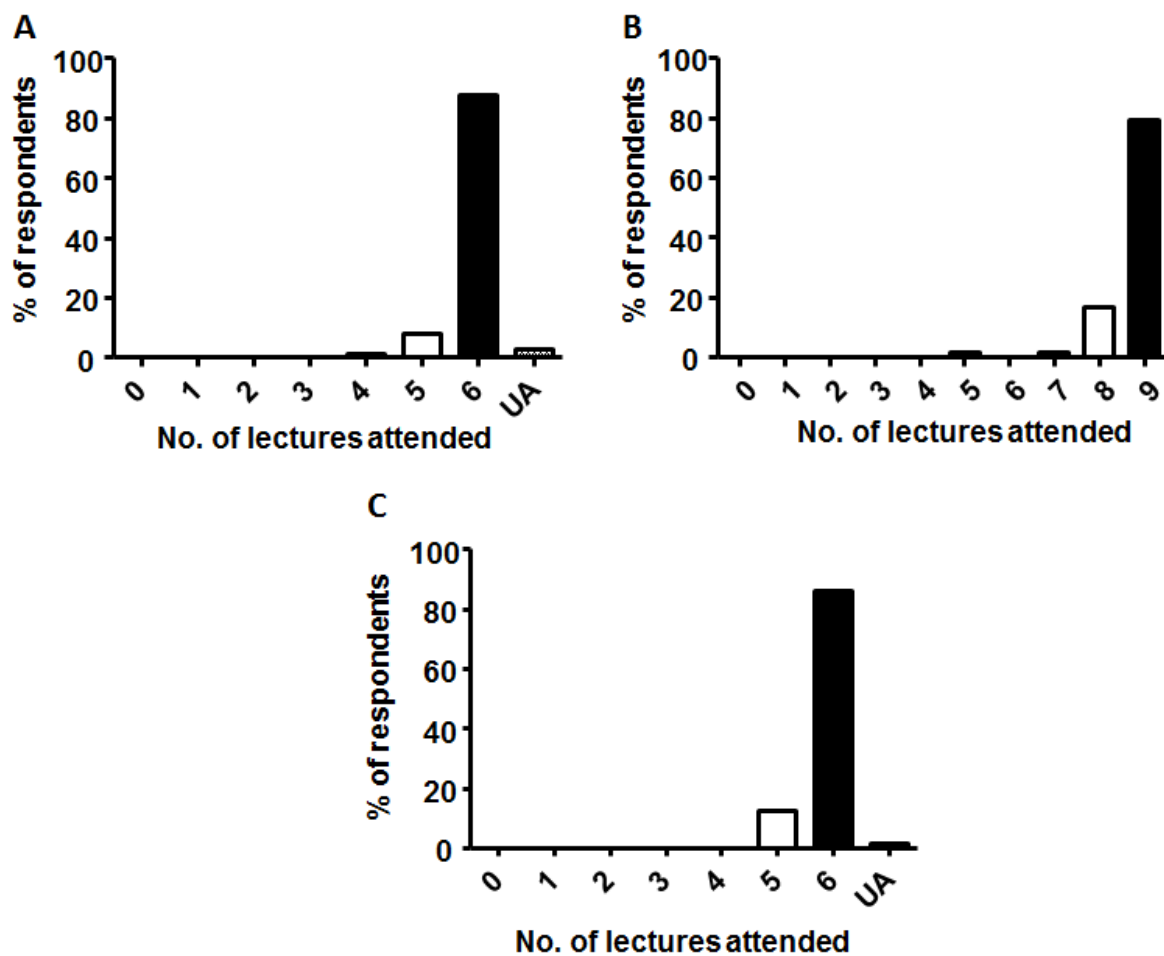


Figure 1: Student lecture attendance. Histograms illustrating self-reported student attendance at Physiology lectures delivered in GM1002 2014-2015 (A) GM1001 2015-2016 (B) and GM1002 2015-2016 (C). UA = unanswered

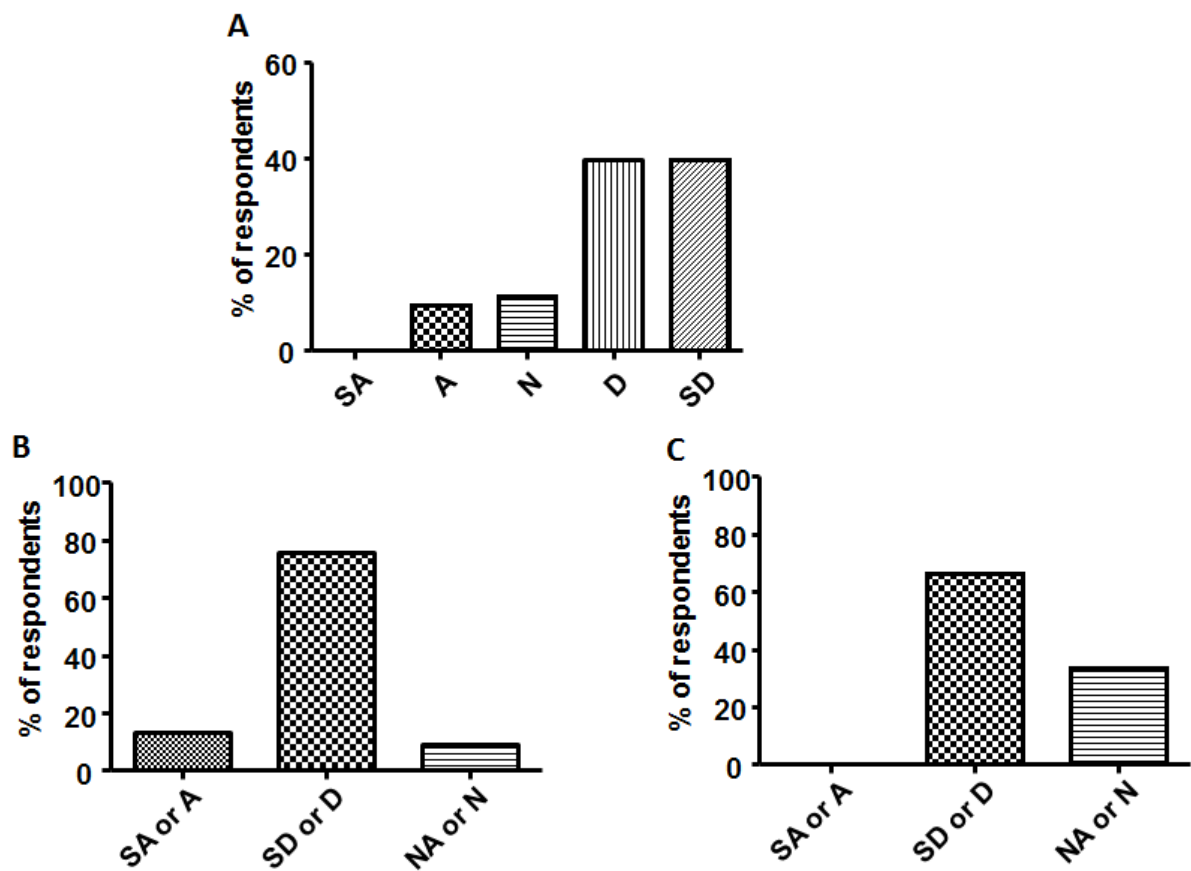


Figure 2: Histograms illustrating responses to the statement, 'I would prefer to have access to full lecture vodcasts rather than have to attend lectures (i.e. get rid of lectures and replace them with vodcasts)'. Overall class response to the question (A), responses of those with a biomedical background prior to entering the UCC GEM course (B), and responses of those with a non-biomedical background (C) prior to entering the UCC GEM course. SA = strongly agree, A = agree, N = neither agree nor disagree, D = disagree, SD = strongly disagree.