

Clinical Laboratory Science: A Profession with Honors

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Texas Tech University Health Science Center (TTUHSC) supports a strong undergraduate honors program. Students are required to enter the Honors College as freshmen and enroll in at least 24 hours of honors-designated classes. Some of the clinical core courses in the clinical laboratory science (CLS) program are designated as honors courses so students can continue their contract agreement with the Honors College to enroll in at least six hours of honors credit at the junior and senior level. By providing further educational experiences out of class, these honors students are able to meet the requirements needed to graduate with highest honors. A CLS honors program not only benefits the student but also the faculty involved and the program curriculum.

ABBREVIATIONS: CLS = clinical laboratory science; SOM = school of medicine; TTUHSC = Texas Tech University Health Science Center.

INDEX TERMS: CLS program; curriculum; honors college.

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The peer-reviewed Clinical Practice Section seeks to publish case studies, reports, and articles that are immediately useful, are of a practical nature, or contain information that could lead to improvement in the quality of the clinical laboratory's contribution to patient care, including brief reviews of books, computer programs, audiovisual materials, or other materials of interest to readers. Direct all inquiries to Bernadette Rodak MS CLS(NCA), Clin Lab Sci Clinical Practice Editor, Clinical Laboratory Science Program, Indiana University, Clarian Pathology Laboratory, 350 West 11th Street, 6002F, Indianapolis IN 46202. brodak@iupui.edu

Academic excellence and relevance are based on established expectations that all students develop the capacity to master content that is complex and challenging.¹ Today, most junior colleges and major universities have some sort of honors program of study to challenge above-average students to achieve a higher level of learning. TTUHSC supports a strong undergraduate honors program of study in the liberal arts or the arts and sciences. Students enter the Honors College program as freshmen and enroll in classes specified by the Honors College.

The Honors College experience is unique, offering outstanding academic and extracurricular opportunities and benefits. The CLS component of this honors program is dedicated to the ideals of an education with depth and breadth to prepare students for a lifetime of learning. The program is designed for those students who are intellectually curious, capable, and who want to challenge themselves to develop critical thinking skills. It was in this spirit that the TTUHSC CLS program sought to form a partnership with the university's Honors College to serve each student transferring into our program from a typical honors-based education in their freshman and sophomore years.

Historically, when undergraduates in the Honors College declared a CLS major and entered the TTUHSC CLS program at the beginning their junior year, they had to abandon their designation as honors students and graduating with distinction as an honors student. Our CLS curriculum was not linked to a basic education through an honors program, and none of our courses were designed to contain an extra component of study that was acceptable to the administration of the Honors College as deserving of honors credit. Four years ago the TTUHSC CLS program applied for affiliation with our institution's Honors College. Some of the CLS clinical core courses were then designated as honors courses in which honors students could continue their agreement contract with the university's Honors College to enroll in a set number of honors credit hours at the junior and senior level. These courses include participation in a special project that honors students are required to complete over a period of several semesters. Since the initiation of the CLS honors curriculum, 8% to 10% of enrolled CLS junior students each

year have opted to take some of the CLS courses as honors courses and have completed research projects in forensic autopsy, clinical and surgical urology, and surgical robotics, in addition to their traditional course work load.

BACKGROUND AND REQUIREMENTS

The honors program administered by our institution's Honors College sets forth high standards that a student must meet before being accepted as an honors student. Entering freshman must have a minimum SAT score of 1200, or a composite ACT score of 26 or higher. The student can also apply if they were in the top 10% of their high school graduating class. For transfer students who wish to participate in the honors program, the minimum requirement is a cumulative college GPA of 3.4 or higher on transferred credit.² There are no restrictions on the minimum number of hours transferred.

Students accepted into the honors program are required to sign a contract with the Honors College stating that they agree to take a minimum of 24 hours of Honors College designated classes. Students must earn an "A" or "B" in each course they take to receive honors credit and to graduate with honors. Of the total 24 credit hours of required honors courses, six hours must be taken at the junior or senior level. Most CLS honors students have only upper division honors credits remaining when they enter the program at the beginning of their junior year. CLS students in the university's honors program are able to pursue graduation with highest honors, provided they write a senior thesis and complete a senior project.

Prior to registration each semester, all honors students are required to be advised by a staff member of the university's Honors College as well as a CLS faculty honors course mentor. Continued honors advisement is necessary to ensure students are making progress toward completion of their honors requirements.

DEVELOPMENT OF THE TTUHSC CLS HONORS PROGRAM

For a CLS course to hold the distinction of an honors course, the course director must include a higher level component in their course, such as a topic-related project. Honors students are required to complete the regularly assigned work in addition to investing time outside of class to complete the assigned honors project. The faculty course director mentors and advises the honors students as they perform their projects. The project assigned to the student usually is broad enough in detail and requirements to involve more than one course and may take up to two semesters for completion and presentation of results.

Since the implementation of the TTUHSC CLS honors program, four classes of CLS students have completed a variety of unique honors projects. Each project was designed to represent the same amount of student effort, time, depth, and uniqueness. A vital role of the CLS faculty mentor is to serve as a liaison between the CLS honors students and any physicians and clinical staff not directly affiliated with the TTUHSC CLS Program who volunteered to participate in the project. The following are examples of projects that were found to be broad enough in complexity and detail, but unique enough to stimulate student interest and give the honors student a greater appreciation of CLS and the medical community.

Example 1. Investigation of autopsy methods

One group of honors students enrolled in the TTUHSC CLS program completed a project investigating autopsy methods. The project included library research, reading assignments, observation of one or more autopsies, the reporting of findings, writing a thesis, and giving an oral presentation. Students assigned to this project worked individually as well as within a group. The project included some assistance and instruction from physicians and staff in the Department of Pathology at TTUHSC as well as the county medical examiner. The willing cooperation of the pathologists and the pathology department was vital to the success of this project. The students were allowed to observe select autopsies at the forensic pathologist's discretion, with the understanding that students arrived on time for the scheduled autopsies. The following textbook was provided for students assigned to this project: Hutchins GM. *Autopsy Performance and Reporting*. Northfield, IL: College of American Pathologists; 1990.

Textbook readings were assigned by chapter and date. Students were required to hand in a two to three page summary of each chapter assigned. Summaries were formatted in narrative form. At the conclusion of the project, a comprehensive written thesis was required as a group effort. The format of the thesis, highlighted in Table 1, included an extensive bibliography of the subject, summaries of each assigned chapter, a report on the history and purpose of autopsy, general autopsy procedures, personal observations of an autopsy, a case study of a selected autopsy including an official autopsy report worksheet, and conclusions.

At the end of the second semester, the students were also required to present their thesis orally to an audience that included peers, CLS faculty, participants from the pathology department, and administrators from the Honors College.

Example 2. The practice of clinical and surgical urology

The second project involved the investigation of a clinical urology practice and common surgical urological techniques. An urologist and his staff allowed students to shadow the physician during his daily rounds at the clinic. The urologist allowed the students to observe several surgeries, in addition to serving as mentor in the participants' education in urological surgical techniques.

Honor students assigned to this project were required to complete a set number of physician shadowing hours as well as observe one or more urology-related surgeries. This provided the opportunity to observe how a specialist's clinic operates and the duties of an urologist. Students were encouraged to keep a journal to record their observations. During their personal observation period, students were directed to pick an interesting case study to work-up and include in their final report. Urology text books and additional references were provided by the urologist and made available to the students. As part of the urology project, students were required to complete a literature review on the history of urology, surgical techniques for removal of kidney stones, and renal transplantation techniques. Students were allowed to work on this project individually and as a group. To ensure timely completion of the project and the continuous flow of topic research materials, students were given a schedule of dates and times to meet with the CLS faculty advisor to submit completed sections of the project.

The case studies selected by the students and their physician mentor focused either on kidney stone surgery or a renal transplantation. The importance of maintaining patient confidentiality in their written report and oral presentation

was emphasized. The students' case study report was required to include a case history including age, sex, initial clinical history and physical findings of the patient, laboratory results, and other supporting diagnostic information. In addition, case studies were to include the patient diagnosis, the basis of diagnosis, a brief explanation of the selected patient's disorder, and the patient's treatment and prognosis.

As with other honors projects, reference book research and written summaries were assigned by topic and date of completion. At the completion of the project assignment students presented a written thesis that was required to be a minimum of 100 pages. The required format of the written thesis and presentation are listed in Table 2. In addition, an oral presentation was given to an audience as above.

Example 3. The use of surgical robotics in the treatment of urological disorders

The third project was based on computer and surgical robotics used in surgery to correct urological disorders. Students shadowed physicians on their daily clinical rounds, observed patients in a clinical setting, and viewed surgical techniques that involved computer interfacing with surgical robotics. Honors students selecting this project were assigned a research thesis and an oral presentation that included an extensive literature search and bibliography, sections on the general history of urology, the history of surgical robotics, and renal disorders corrected with surgical robotics. Each student had the opportunity to include in the thesis a case study

Table 1. Required format of autopsy thesis

- A. Title page (including all student names)
- B. History and purpose of autopsy
- C. Autopsy procedures
- D. Discussion of observations
- E. Discussion of autopsy reporting
- F. Autopsy report worksheet case studies
- G. Chapter summaries
- H. Conclusions
- I. References
- J. Hard copy of PowerPoint™ presentation

Table 2. Required format of renal surgical techniques thesis

- A. Title page (including all student names)
- B. Table of contents
- C. History and purpose of urology
- D. Renal stone and transplant-related disorders
- E. Common urology procedures of stone treatment and transplantation
- F. A discussion of observations
 - 1. Physician shadowing
 - 2. Surgical procedures
- G. Related case study
- H. Conclusions
- I. References
- J. Hard copy of PowerPoint presentation

workup of an actual pathologic case that was corrected by robotic techniques. The highlighted case study was required to include all of the components previously described. The required format of the written thesis and presentation are shown in Table 3.

BENEFITS OF AN HONORS PROGRAM

Being a CLS honors student places the student on an academic track that provides many benefits not available to the typical CLS undergraduate student. At TTUHSC, Honors College students experience an elevated level of education in which they are personally involved and receive exposure to a stimulating academic environment. By working on their assigned projects, they have the opportunity to participate closely with professors and clinicians. The honors students have increased access to non-academic medical professionals in private practice who take a personal interest in them and their medical education. They are encouraged to pursue cutting edge topics outside of the normal CLS class routine that will broaden their academic horizons. A CLS honors education requires more intensive writing and increased active engagement in the learning process.

Access to information and opportunities not readily available to the typical undergraduate student is another benefit. All honors students have access to information about education, travel, scholarships, and intellectual opportunities across the nation and in other countries. A support system is available to help with application to competitive national scholarship

programs or for financial support in the pursuit of further research opportunities. In addition, these students enjoy special benefits at the university library, access to an honors student computer laboratory, and guaranteed first day registration for classes.

In the typical TTUHSC CLS classes, at least one third of students declare themselves as pre-med and begin application to medical school upon graduation from the CLS program. The majority of our pre-med students apply for medical school admission during their senior year with the intent to enter medical school the fall after their graduation from our CLS program. Working closely with TTUHSC's medical school, Honors College students can take advantage of an early acceptance program. This program allows these students to waive the Medical College Admissions Test and to apply to TTUHSC's School of Medicine (SOM) before they complete their junior year if they demonstrate excellent academics. Successful early acceptance applicants are notified of their acceptance into the SOM in late January, and complete their baccalaureate degree prior to admission into the SOM. Criteria of a successful applicant in the early acceptance program include entrance into the university's Honors College as a freshman, in-state residency, and a composite score of at least 1300 on the SAT or at least 29 on the ACT.³ It has been observed in our program that involvement in the Honors College actually enhances the honors student's chance of successful admission into medical school.

Participation in a scholastic honors program not only benefits our CLS students but also benefits the CLS program as a whole. Being involved in the university's Honors College program gives the CLS program a higher level of academic credibility for scholarly activity and serves as an excellent recruiting tool. By serving the academic needs and requirements of honors students, the CLS program attracts students with higher levels of scholastic preparedness and increases overall student enrollment. Many top pre-med students have been honors students who majored in the biology or chemistry disciplines. By offering junior and senior level clinically-based honors classes in the CLS curriculum, many of the honors students who desire a clinical education at the undergraduate level choose CLS as their major. CLS faculty have the satisfaction of knowing that these students will not only become exceptional clinical laboratory scientists and ambassadors, but also exceptional doctors whose first love is the clinical laboratory.

Table 3. Required format of renal surgical robotics thesis

- A. Title page (including all student names)
- B. Table of contents
- C. General history and purpose of urology
- D. History of the use of surgical robotics
- E. Renal disorders corrected with surgical robotics
- F. Urologic surgical procedures using robotics
- G. Discussion of observations
 1. Physician shadowing
 2. Surgical procedures
- H. Related case studies
- I. Conclusions
- J. References
- K. Hardcopy of PowerPoint presentation

CONCLUSION

The CLS honors program recruits, retains, rewards, and enriches the intellectually curious and academically capable student through participation in a variety of clinical research projects and learning experiences. These students have entered the institution's Honors College at the freshman level having met the university's high academic standards. The benefits of this program are shared by the students, the faculty, and the academic program itself. The TTUHSC CLS honors students strengthen the program by exploring, defining, and pursuing unique clinical opportunities in a way that will maximize their academic and personal growth.

The faculty in the TTUHSC CLS program have designed projects that not only challenge honors students, but provide new opportunities to interact with and observe other medical professionals. Students learn writing and presentation skills that would ordinarily be reserved for graduate education. By providing educational experiences such as forensic autopsy procedures, physician shadowing, and the observation of cutting edge surgical techniques, these students are able to more than meet the requirements needed to graduate with highest honors.

Honors students receive a broader medical education than the traditional CLS student and are encouraged to develop

self-discipline and to engage in self-directed learning. CLS honors students continue to enjoy all of the perks of being a member of the Honors College. Faculty share the opportunity for growth and mentor students as they learn the newest advances in the medical profession. Finally, the CLS program collectively benefits by providing unique experiences to unique students who learn to think "outside the box". Honors College educational programs that require extra time, imagination, and opportunities are worth the investment.

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