

Does multidisciplinary team teaching using a team-based learning format improve exam scores?

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Introduction

Curricular integration represents collaborations between disciplines to establish a coherent curriculum and has become the dominant recommendation for medical education in the second half of the twentieth century. To increase curricular integration and renew student interest in large classroom learning, a group of medical educators at the UNTHSC designed a novel curricular approach. This study investigated whether the novel curricular approach improved exam performance.

Design

Over the course of six months, a pathologist, pulmonologist, and pharmacologist met over Zoom every three weeks to craft clinical vignettes and questions, select histology and radiology images, and finalize a TBL structure. Each case and questions were projected on a screen for ten minutes during which the 240 students worked in thirty groups of eight students each to answer six to eight questions. At the close of ten minutes, a random group was selected, and the group speaker reported the group answer to one question. Dissenting opinions were solicited, and the correct answer was displayed on the screen. Following six cases, a twelve-question individual quiz emphasizing the major points of each case was administered.

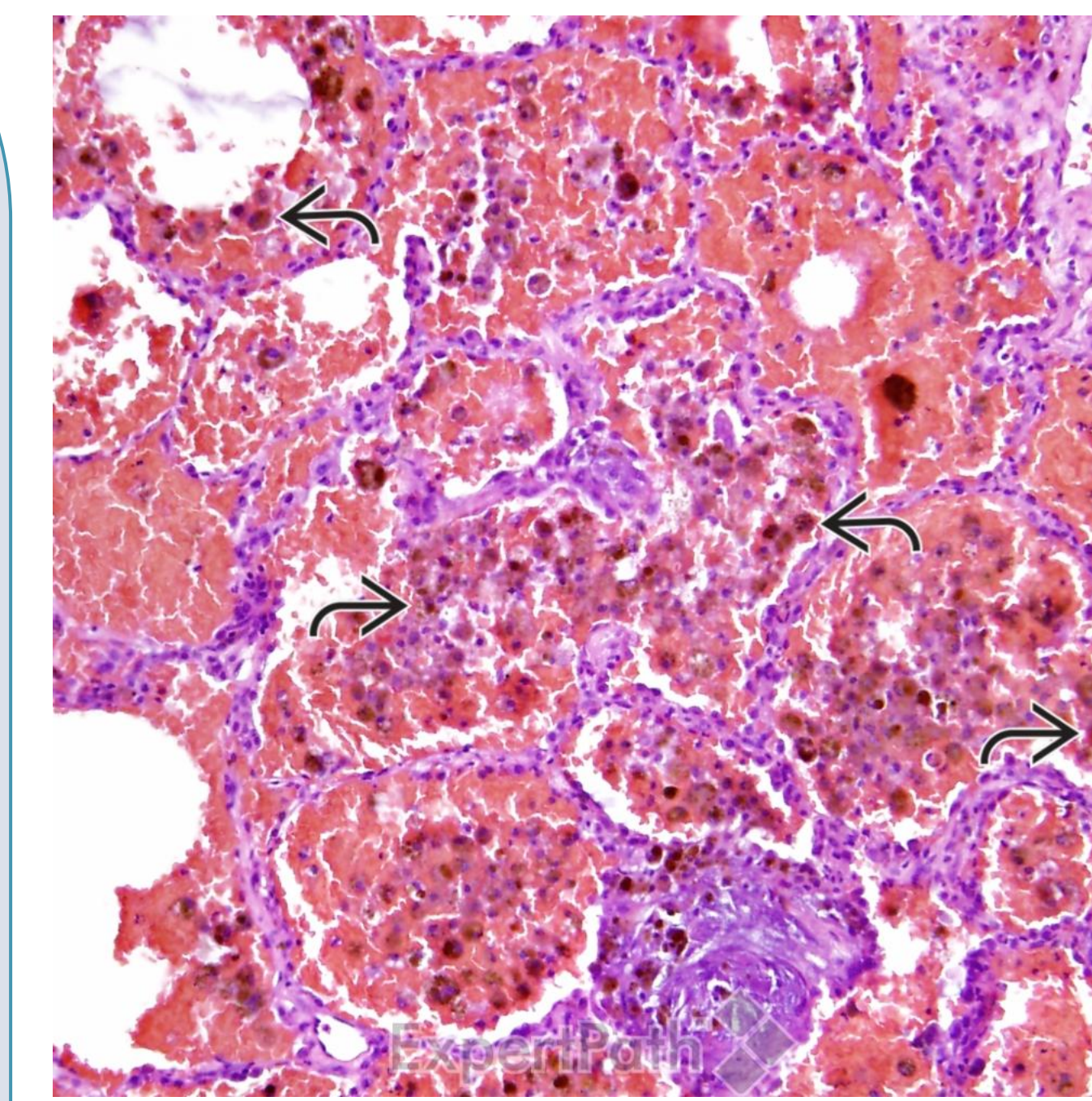
Quantitative Methods

The percent correct on identical exam items from 2021 and 2022 was collected via ExamSoft and a two-tailed independent T-test was performed. End of course survey comments were also collected.

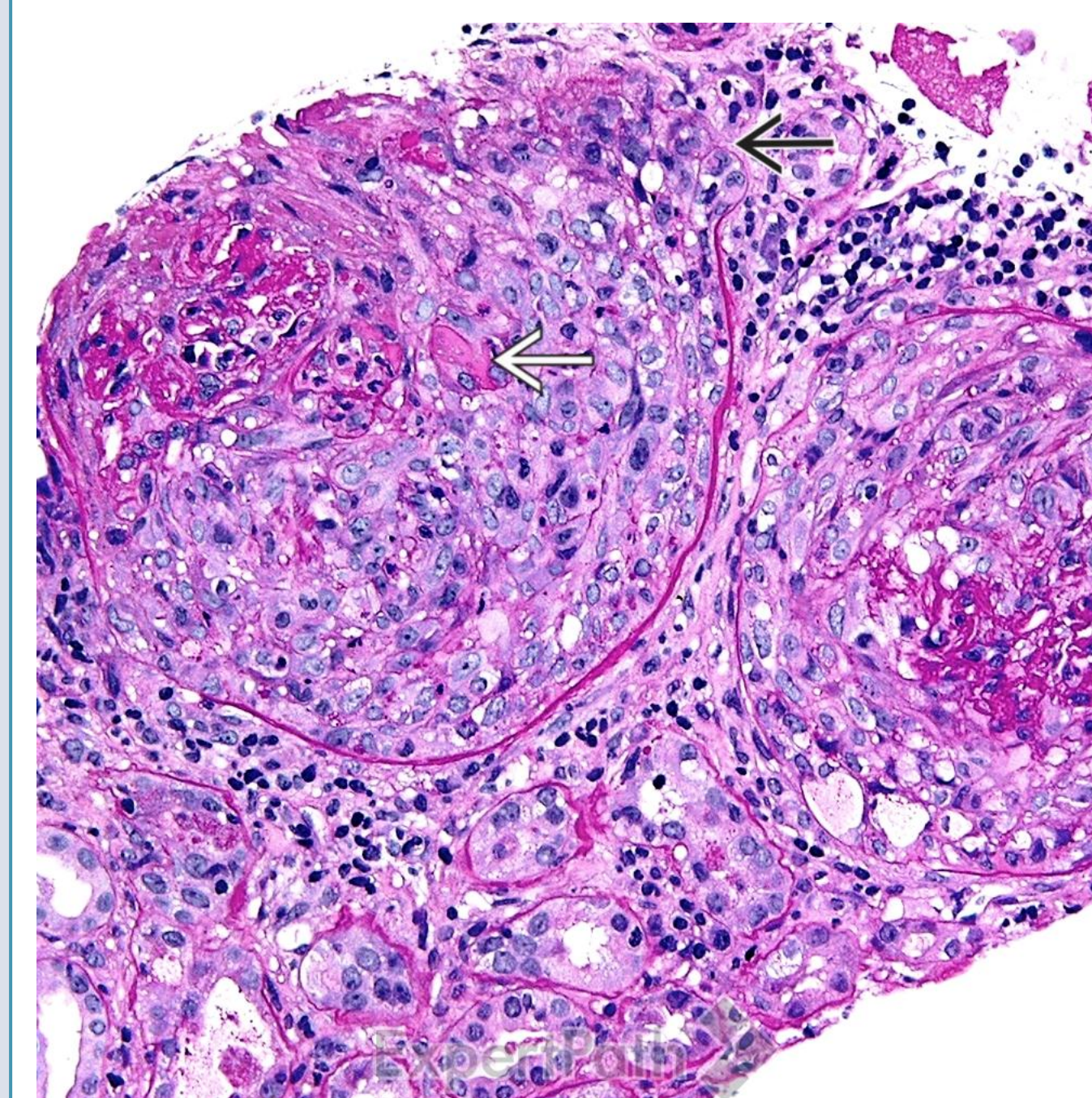
Sample team-teaching case

A 38-year-old male presents to his primary care physician after coughing up blood several times in the past week. He has been coughing more frequently and having difficulty finishing his daily neighborhood walks. He recently quit smoking. Physical examination reveals a blood pressure of 145/88 mmHg. Fever and tachypnea are not present. Chest x-ray demonstrates diffuse, fluffy infiltrates bilaterally. Urinalysis reveals proteinuria, hematuria, and RBC casts. A spot protein/creatinine ratio shows significant but not nephrotic range proteinuria. A kidney biopsy and lung biopsy are performed. (see images at right).

1. What is the differential diagnosis? What about infectious etiologies? Neoplasia? The three BIG categories would be autoimmune, infectious, and neoplastic. Goodpasture syndrome, Granulomatosis and polyangiitis (Wegener granulomatosis), microscopic polyangiitis, and systemic lupus erythematosus would be autoimmune. Infectious etiologies would include pneumonia, fungal infections, or tuberculosis. Neoplasia would be lung cancer.
2. How does your differential diagnosis change depending on the quantity of hemoptysis? How does the renal involvement affect your differential diagnosis? DAH is commonly associated with an autoimmune etiology. Goodpasture's, for example, presents 40-60% of the time with DAH, but less dramatic presentations of Goodpasture's are also seen and may simulate infectious etiologies or even lung cancer. Lupus, GPA, and MPA can all affect lungs and kidneys. Lupus, GPA, and MPA often present with constitutional symptoms as well. The younger the patient (young female smoker) with Goodpasture's, the more likely for them to have the dramatic presentation of life-threatening hemoptysis vs "massive" hemoptysis as seen in Aspergilloma, Bronchiectasis, Cancer/neoplastic, and TB.
3. Describe what you might see on lung histology? Kidney histology
Diffuse alveolar hemorrhage on lung histology. Crescentic glomerulonephritis on kidney histology.
4. Which antibody tests should be performed by serology and what do they test for?
Anti-glomerular basement membrane (Goodpasture syndrome), PR3-Anti-neutrophilic cytoplasmic antibody (GPA), Anti-double stranded DNA (SLE), and Myeloperoxidase-Anti-neutrophilic cytoplasmic antibody (microscopic polyangiitis).
5. What is the target of the anti-glomerular basement membrane antibody and what organs are affected?
 α_3 chains of type IV collagen in the basement membrane of the pulmonary alveoli (lungs) and renal glomeruli (kidneys) are the target.
6. What type of hypersensitivity reaction is responsible for this patient's disease process?
Type II. The classical complement pathway activated by autoantibodies results in the recruitment of neutrophils and monocytes.
7. What treatment(s) would you choose for this patient?
Plasmapheresis, cyclophosphamide, and corticosteroids until anti-GBM titers become negative. Rituximab has been used in several case reports as an alternative approach in patients with refractory or recurrent disease.



Diffuse intraalveolar hemorrhage (DAH) in the lung



Large cellular crescents in the kidney

Images from ExpertPath Diffuse Alveolar Hemorrhage and Anti-GBM Glomerulonephritis. <https://app.expertpath.com>. May 4, 2023.

Results

The two-tailed independent T-test showed no significant difference in exam performance between 2021 exam takers (M= 91.2%, SD = .0775) and 2022 exam takers (M= 90.9%, SD= .0845); $t(38) = .1624$, $p = .8714$.

Discussion & Conclusion

Although data showed no difference in student performance on identical exam items, many positive comments about the TBL format were noted on the end of course evaluation.

"I found the TBL session very helpful to apply our knowledge to the cases."

"Just wanted to say thank you all for doing a great job on the TBL session. I know this was something new for you and I thought you all did a wonderful job."

Suggestions for enhancement from a student focus group included post-class distribution of the cases and a debrief of the individual quiz questions. Adoption of this curricular format is planned in additional systems courses with modifications and further data will be collected.

Even if exam performance is not enhanced, novel team-based educational strategies may be an effective strategy to enhance student engagement.

Disclaimer

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