

# Not the Last Word: Shubik Dollar Auctions and the Infinite Cost of Residency Applications

Joseph Bernstein MD<sup>1</sup> 

Running a Shubik dollar auction is a clever way to make money, if you can find people willing to play along.

A Shubik auction (named after its inventor, Yale economist Martin Shubik [8]) is similar to a regular auction, but with a twist: In a Shubik auction, not only does the highest bidder pay the winning price, but all of the losing bidders must also pay their final bids. Because of this, an auctioneer can sell off a dollar bill to a winning

bidder for 51 cents and still make a profit, as long as the other bidders collectively offer at least 50 cents, which the auctioneer also collects.

It's the prospect of being able to buy a dollar bill for only 51 cents that induces a person to enter such an auction. But on closer examination, you'll see that such an outcome is unlikely to take place. That's because when 51 cents is the highest bid received, the rival bidder who offered 50 cents is not simply going to drop out there. Doing so would result in remitting the 50 cents (per Shubik rules) and going home with nothing to show for it. For that reason, he or she will bid 52 cents. True, the gains at that price are smaller, but at least there will be some gains.

Of course, that same "I must press on" logic applies to the bidder at 51 cents who has now been trumped, so you can see where this is heading.

The really interesting aspect of the Shubik auction becomes evident when the current bid is 99 cents. At that point, the bidder at 98 cents can either drop out or bid a full dollar. For the latter, the gain is nil, but at least such a bid will stave off the 98-cent loss. But if that bid is made, where does that leave the contestant who was at 99 cents? The options for that person would be to fold and take the 99-cent loss or to make the seemingly stupid bid of USD 1.01 for a dollar bill worth

only 100 cents. Of the two, bidding USD 1.01 is clearly preferable. And so it goes. There is no logical endpoint (Fig. 1).

An analysis of the Shubik auction is relevant to the leaders in orthopaedic surgery who are responsible for the system in which valuable orthopaedic residency spots are essentially auctioned off. And yes: Distributing residency spots is an auction. Nearly all medical students possess the potential to be appealing candidates for an orthopaedic residency, as long they are willing to pay the associated costs. As such, the seats go to the highest bidder.

- "I see your three away rotations and raise you one!"
- "You say you will study for 6 weeks to pump up your Board scores? Well, I will study for 8 weeks!"
- "If you will devote all of your 4th-year elective time to research projects, I will too, but I will spend a 5th year in research as well!"

With that context, the residency distribution process is not merely an auction; it's a Shubik auction. Here's why: The students who retreat to the silent monastery for USMLE study are not getting that time back, regardless of the outcome of their job search. The students who commit to doing three away rotations, only to lose out to rivals who do four, still have travel bills to pay. To offer a bid, candidates do not merely declare their intentions; they must act on them.

The fact that the residency allocation process is a Shubik auction has particular


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**Fig. 1** This cartoon, courtesy of my prompts to ChatGPT, depicts the effects of a Shubik auction, as proposed by Avinash Dixit, an Economics professor at Princeton University [5]. You can do this yourself. The next time you give a lecture and you hear the audience clapping, politely say the following: “I love your applause! I love it so much, I will give USD 20 to the last person who stops clapping.” You can count on at least a few people to be intrigued and clap a bit longer than needed. At that point, you have created a Shubik auction, though instead of monetary bids, the currency is the time and effort spent clapping. As people continue clapping, they invest more time and energy, and the longer they clap, the more they’ve invested, making it harder to quit. As shown, some people may pass out from clapping long past the sensible quitting point.

relevance regarding the natural limits on what candidates may be willing to pay. Specifically, applicants cannot be counted on to limit their expenditures to only logical amounts. As shown, in a Shubik auction, it becomes perfectly logical to commit to spending an illogical amount to defend sunk costs.

It is also worth noting that the Shubik nature of this process is baked in long before the residency application season commences. After all, a person applying for a housestaff post has already paid the vast sunk costs of completing premedical studies,

successfully gaining admission to medical school, dedicating at least 3 years to medical education, and disbursing more than USD 250,000 (whether earned, gifted, or borrowed). At application time, it may seem silly to spend even more, but dropping out at that late date creates losses that are both large and certain.

Given all of that, those in charge of the residency selection process must try to place limits on wasteful bidding:

- It’s wasteful for students to spend months studying to earn an

excessively high USMLE score, especially when that time could have been used for studying more relevant subjects. For that reason, I’ve argued that a test limited to musculoskeletal content would make a much better *de facto* entrance exam than the USMLE [1].

- It’s wasteful for students to scramble for research projects, darting from lab to lab like Pac-Man eating dots, especially compared to the prospect of students engaging in a small number of meaningful projects. For that reason, I’ve argued for replacing the standard CV with a list limited to one’s top three most significant accomplishments [2].
- It’s wasteful for students to apply to 98 or more residency programs shotgun style. That just enriches the application service, ERAS, and makes the job harder for those trying to read the applications. For that reason, I’ve argued for a signaling system and a constrained list of truly desired sites [3].
- It’s wasteful for students to attend month-long away rotations just to demonstrate basic competence and continence. Perhaps by restricting these rotations, we will create the incentives for local faculty to finally step up and provide the accurate evaluations that are needed.
- It’s wasteful for students to attend in-person interviews if those sessions are not conducted with validated protocols that are discerning without being discriminatory. Given that such validated protocols do not currently exist, consideration should be given to skipping this expensive and dubious exercise altogether, at least if applicants are expected to fund it.

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Much of this wasteful spending can be avoided if residency positions were allocated through a pure auction [4]. In a pure auction, resident applicants would still pay, but only if they win. What we have currently, though, is a Shubik auction. Payments are extracted from all payers. Even worse, at least some fraction of those payments is simply wasted: misused time, misspent energy, and misdirected travel. Fourth-year medical students, having paid such high costs to make it to their fourth year, find it eminently sensible to spend senselessly on residency applications. We must protect applicants from themselves. Good stewardship demands nothing less.

### Douglas R. Dirschl MD

**Wilhelmina Barnhart Professor and Chair, Joseph Barnhart Department of Orthopedic Surgery, Baylor College of Medicine**

Dr. Bernstein offers an intriguing and powerful commentary, introducing the concept of a Shubik auction to underscore his point that the amount of time and money that orthopaedic residency applicants are investing in their applications is increasing at an alarming rate. The analogy Dr. Bernstein draws is particularly apt, as it relates to the role of orthopaedic residency leadership in reinforcing and perpetuating applicants' behaviors. Let's examine leadership's role in two of the troubling recent trends: the expanding number of away rotations and the addition of a research year.

There are two pathways by which an applicant is evaluated by an orthopaedic residency program. The applicant is either "known" to the program (by virtue of having worked with the program on clinical rotation) or "unknown" to the

program (having applied via ERAS without having done an in-person rotation). The former group has an advantage in the process—in the academic programs I've been part of throughout my career, "rotators" have constituted about one-half of the residents accepted into a program. It's widely known that rotating at a program confers an advantage, so it is no wonder that applicants try to do as many away rotations as they possibly can.

What about the "unknown" applicants to the program? Each program applies its own scoring system to these candidates' applications, and are more likely to offer interviews to those with the highest scores. While applicants cannot influence many of the items that might be scored (the college/medical school attended, for example), one item that can be influenced is the number of research projects and publications. It is no surprise then that applicants are advised to maximize the number of projects/publications to improve the likelihood of being offered an interview. The natural extension of this is to pursue an extra year of medical school devoted to research, which is what many recent applicants now choose to do.

The logical result—following Shubik auction principles—is that applicants will attempt to maximize *both* away rotations and projects/publications. And it is we, orthopaedic leaders, who reinforce this trend among applicants, either explicitly, by advising students to do more away rotations or a research year, or tacitly, by perpetuating application scoring systems that offer more points for more projects/publications. This leads to the "infinite cost" postulated by Dr. Bernstein.

It is our responsibility to accept blame for these troubling recent trends and to propose solutions. A number of new approaches have been put into play

in the past several years. The USMLE Step 1 examination now is pass-fail rather than scored; signaling helps clarify who is deeply interested in our programs; letters of recommendation have a standardized format and evaluation scale; and virtual interviews are available and easy to do. We can choose to see these as impediments and respond by encouraging even more rotations and publications. Or we can choose to see these as opportunities to adopt a new perspective and behave differently. I hope we will choose the latter.

The time has come for us to provide honest evaluations of applicants, using the entire scoring scale; focus on applicants' personal qualities more than on scores and counts; minimize discretionary expenses for applicants (embrace virtual interviews, for example); and embody—in our statements *and* our behaviors—that the person is much more important than the pedigree.

### Amiethab Aiyer MD, FAOA, FAAOS

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The process of applying to residency and orthopaedic surgery has become increasingly challenging. The activities that one may get involved with to increase one's odds in the Match—research publications, networking, and advocacy, to name a few—have become increasingly fickle, and the amount of work invested will not deliver the desired result for a growing number of individuals. From this standpoint, Dr. Bernstein is right: The residency match is akin to a Shubik auction.

We now have the complicated task of guiding students to succeed in this

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auction. For students without a home program, advisors must start by making sure these students know about the Shubik auction-style process to begin with. Limitations in advising and support for competitive specialties means that students are left in part to fend for themselves. For these students, identifying opportunities for orthopaedic engagement—such as early experiences in clinic and the operating room, as well as orthopaedic research projects—are some of the of the best ways an advisor can try to guide a learner toward a successful match.

Many students will pursue time off in the form of a research year with the goal of bolstering their CVs, often at the suggestion of faculty advisors. Indeed, NRMP data [7] confirm that the emphasis on research continues to grow. I am commonly asked about the number of publications a student needs to match into an orthopaedic residency, but unfortunately, there's no easy answer. A few higher-impact papers could lead to a deep relationship with a mentor who could speak passionately on behalf of a candidate, which may carry more weight relative to a larger number of lower-impact manuscripts. Each student's research year is a unique experience, and the number of publications should not be the most important goal. The value in taking a research year to bolster relationships and establish a network cannot be overstated: For many, this year of work is what leads to that proverbial phone call, email, or "signal" from a faculty mentor to a program of interest.

The new tool of "signaling"—which is now in its third cycle—has given students an opportunity to advocate for themselves too, thereby gaining auction entry. It is important to understand that signals are now commonly used as part of the residency application screening process, decreasing the number of

applications received by each program. This means that students need to be thoughtful about which programs they'd like to send signals to. Considering that most students will match at a program they have signaled, it is generally not recommended to apply to more programs than the allotted number of signals available [6, 9].

While a signal certainly offers a student the opportunity to advocate for themselves, letters of recommendation and medical student performance evaluations (MSPE) may give a program insight into a learner's journey and reason for pursuing orthopaedic surgery. However, the away rotation may provide a better opportunity to demonstrate a candidate's affective attributes, as well as how they might fit into the culture of that program. Away rotations also give learners—especially those who come from underrepresented populations—the opportunity to evaluate how welcoming and empowering a program's culture is.

So how can one increase the odds of succeeding in this auction? While signals themselves are binary in nature, the impact of the signal can be weighted by time spent at a given institution, in the form of a research year or an away rotation. This is an opportunity for the program and the learner to evaluate how they mesh and connect with one another, and in this regard, they can be more valuable—both from the vantage point of the candidate and the program—than formal interviews or the submitted application.

Considering that students cannot spend time at every signaled program, the student application serves as an important portfolio of their individual skill sets. Applications are now increasingly infused with a diversity of experiences, publications, leadership opportunities, and other expressions of students' creative energies. Students use the application to market themselves, to

demonstrate how they have found a successful equilibrium between academic and extracurricular pursuits. Programs may see this as useful information—an applicant's ability to use time efficiently during medical school may be indicative of a student's capability of handling the intense and busy demands of orthopaedic surgery residency. While we should encourage our students to make sure this theme comes through in their applications, I do agree with Dr. Bernstein that limiting the number of experiences listed on ERAS to the most important ones is a good way to encourage learners to be intentional as they fill out their applications, and this has been in place since the 2023-24 cycle.

Whether entry to the auction is a USMLE Step 2 score (which may level the academic playing field, given the variability of grading systems across the country), a signal, or completion of an away rotation or research fellowship, ultimately, the overarching currency is time. It's crucial that candidates spend it well, and convey—through the application and in-person at interviews and visiting rotations—that they are able to manage it capably.

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