



## CKJ REVIEW

# Enhancing outpatient nephrology experience for internal medicine residents

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## Abstract

Interest in nephrology careers continues to remain low in the USA. Educational innovations that enhance interest in nephrology among medical trainees are being actively studied. While internal medicine (IM) residency programs commonly offer the inpatient nephrology elective to the resident, outpatient nephrology experience is lacking. Understanding the provision of care in outpatient and home dialysis and management of patients with glomerular diseases, chronic kidney disease and kidney transplantation are vital components of an outpatient nephrology rotation. In this review article, we share our experiences in incorporating outpatient nephrology to the IM resident's elective time. We also present the structure of the nephrology rotations at our programs and suggest several learning opportunities in outpatient nephrology that the training community can provide to medical residents. Strategies to effectively set up an outpatient nephrology rotation are also described. While more educational research on the impact of outpatient nephrology on resident learning and career choices are needed, we encourage a collaborative effort between faculty members in nephrology and the medicine residency programs to provide this unique learning opportunity to IM residents.

**Key words:** educational research, elective, medicine resident, nephrology elective, rotation

## Introduction

The number of applicants for nephrology fellowship training in the last several years has been dismally low when compared with the available positions [1]. Various educational research studies have recently attempted to identify reasons for the declining interest in nephrology among medical trainees [2–4]. A survey of US non-nephrology internal medicine (IM) subspecialty fellows in 2011 suggested that poor learning experiences and lack of mentorship were some key factors for not considering a career in nephrology [2]. Clinical educators thus have the opportunity and obligation to improve the educational

experiences of medical trainees during their exposure to clinical nephrology.

Most nephrology subspecialty electives in IM residency in the USA are based in a teaching hospital. More than half of the 91 nephrology fellowship program directors surveyed in the USA in 2013 described their nephrology elective for IM residents to be a pure inpatient experience [5]. For programs that offered outpatient nephrology experiences only 11% offered several renal clinic experiences (on average one or two clinics per week) during their 4-week nephrology elective and even fewer (8.8%) did so during

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their 2-week elective [5]. There were no programs offering a 2- or 4-week inpatient rotation with an average of more than two clinics per week [5]. While most of the program directors (89%) agreed that an ideal nephrology elective should provide both inpatient and outpatient experiences, 'inpatient service needs', 'too much work to coordinate outpatient experiences', 'lack of resources to rotate medical residents in outpatient hemodialysis unit' and 'lack of resources to rotate medical residents in outpatient renal clinics' were the top four reasons cited for limited exposure to outpatient nephrology among IM residents.

In this review article, we share the various structures of outpatient nephrology rotations at our institutions and also discuss challenges that can be encountered in setting up an outpatient nephrology rotation. We also present strategies to help the educational community and leaders successfully introduce outpatient nephrology curriculum to their trainees and ways to measure outcome or feedback. While our discussions are focused on IM residents, the strategies described here can also be applied to medical student electives. We believe that our article can also offer ideas on educational research and is likely to aid faculty development, especially if faculty members take leadership roles in education of medical trainees and curriculum development.

### Learning opportunities and benefits of the outpatient nephrology curriculum

There are several medical disorders (or topics) in nephrology that can be best taught in the outpatient clinic, including evaluation and management of chronic kidney disease (CKD), hypertension, glomerulonephritis, nephrotic syndrome, hematuria, proteinuria and nephrolithiasis. Reviewing the learning objectives as listed in the outpatient nephrology curriculum (Table 1) makes it clear that many of these disorders can be best taught to IM residents in the outpatient setting, and not in the hospital. Exposure to outpatient nephrology during residency also allows IM residents to better evaluate and manage common nephrological conditions that they themselves would encounter in the medicine clinics.

Outpatient dialysis (in-center dialysis, home peritoneal dialysis and home hemodialysis) experiences are an essential component of the outpatient nephrology curriculum. Patients receiving their maintenance hemodialysis treatments in the outpatient or free-standing units are usually less sick and have better functional status than patients receiving acute or chronic dialysis in the hospital setting [6]. Thus, if IM residents were only exposed to sicker patients receiving dialytic therapies in the hospital setting, it is very likely that they would develop a skewed view of the many stable patients who chronically dialyze outside the hospital. Participation in outpatient hemodialysis rounds also allows IM residents to better understand the delivery of dialysis care by various members of the dialysis team (nephrologist, nurse, technicians, dietitian and social worker) who have different but intertwined roles in dialysis patient care. Furthermore, home dialysis options are being increasingly offered to patients with end-stage renal disease, thus allowing greater flexibility and choices than in-center hemodialysis [7]. A visit to the home dialysis program can also be an eye-opener, as it can expose the IM resident to the decision-making process, dialysis training and the quality of life enjoyed by the home dialysis patients [8]. Working with the transplant nephrologist in the transplant clinic would allow an understanding of the benefits and risks of kidney transplantation, immunosuppression protocols, transplant complications and the process of donor-recipient evaluations.

Medicine residents routinely take care of hospitalized patients with acute kidney injury (AKI) and electrolyte disorders such as hyponatremia and hyperkalemia, several of which may not require help of the inpatient nephrology team [9]. If the nephrology elective were to be purely inpatient-based, residents would be rounding on several patients with the same nephrology problems that they would otherwise encounter during their medicine ward and intensive care unit rotations. Moreover, they would lose the opportunities for learning many outpatient problems seen in nephrology, as mentioned earlier. Some may express concerns that transitioning from the inpatient to the outpatient setting in a subspecialty elective would cause IM residents to lose valuable learning time and patient interaction as there are no formal 'bedside rounds' in the clinic setting. We certainly do not wish to imply that performing inpatient consults is less useful than outpatient nephrology, as there is educational value to reviewing the evaluation and management of common inpatient nephrology issues with a specialist. However, we do not believe that repeating the discussions on workup of these inpatient conditions is an efficient use of the resident's limited elective time. Outpatient nephrology learning complements and enhances learning in the inpatient setting. Furthermore, we believe that enhancing exposure to outpatient nephrology during the elective time provides a broader scope of what the field has to offer, especially if the resident wishes to consider a future career in nephrology.

Exposure to outpatient nephrology during IM residency would give a more realistic insight into the professional life of the practicing nephrologist as compared with that afforded by the pure inpatient elective. A significant percentage of the services provided by practicing nephrologists in the USA is based in the outpatient setting (dialysis unit and clinics). Exposure to outpatient nephrology would thus allow an understanding of the processes of care (such as clinic protocols for erythropoietin or intravenous iron administration), models of practice and clinical administrative responsibilities of the nephrologist. This is especially important for the IM resident potentially considering a career in nephrology.

Nephrologists cherish the continuity of care afforded when patients transition from CKD to dialysis to transplant [10]. This unique attribute of nephrology can best be evidenced in the outpatient setting, where the nephrologist plays a key role in guiding these transitions of patient care [11]. The importance of longitudinal care to resident learning is exemplified by the IM Residency Review Committee's recommendation to increase outpatient learning [12]. As a result, many IM programs have a 4+1 structure (4 weeks of inpatient medicine followed by 1 week of outpatient clinic). Thus, there is a greater need than before for outpatient nephrology learning as residents are expected to spend more time in the outpatient setting.

### Can outpatient nephrology experiences enhance interest in the field of nephrology?

While there is little evidence that exposure to outpatient nephrology increases the number of residents pursuing nephrology subspecialty training, surveys have shown great satisfaction among residents. At the North Shore University Hospital and Long Island Jewish Medical Center, half of the resident class was assigned to either the traditional inpatient nephrology or the redesigned inpatient-outpatient rotation. Eighty-six percent of IM residents who completed the 4-week redesigned nephrology elective reported that they would consider a career in nephrology, as opposed to

Table 1. Learning objectives in an outpatient nephrology curriculum

Competency domain	CKD	Hypertension	Glomerular diseases	Hematuria and proteinuria	Nephrolithiasis	Dialysis therapies and transplantation
Medical Knowledge	Discuss management of diabetic kidney disease, including hypertension control, glycemic control and use of ACE-I/ARB	State targets for blood pressure control based on risk for cardiovascular disease and CKD progression as recommended in the national guidelines	List the different causes of glomerulonephritis and nephrotic syndrome	State the various renal and extra renal causes of gross or microscopic hematuria	Identify risk factors for various stone diseases using data from 24-h urine studies or stone composition	Describe the following dialysis therapies, including how they work, and when they should be offered: (i) In-center hemodialysis (ii) Home peritoneal dialysis (iii) Home hemodialysis
	Explain pathophysiology and management of anemia, hyperphosphatemia and secondary hyperparathyroidism in CKD	Compare and contrast the use of antihypertensive drugs including indications, mechanism of action and adverse effects in CKD  Summarize indications for use of ACE-I or ARB in hypertension and CKD, and management of adverse effects, i.e. hyperkalemia and AKI	Describe the serological work-up and role of kidney biopsy in the diagnosis and prognosis of glomerular diseases	Outline the diagnostic workup of hematuria including imaging and referral to urologist	Discuss the medical options to reduce risk of future stone events	Describe the vascular access options for dialysis and demonstrate knowledge that central catheter is the least preferred access
Patient care	Provide counseling on prevention of CKD progression, addressing: (i) Need for medication adjustment such as discontinuation of NSAIDs or metformin (ii) Importance of home blood pressure and glucose monitoring	Define resistant hypertension, list its causes and outline diagnostic workup of resistant hypertension	Review management of glomerulonephritis and nephrotic syndrome, including adverse effects of immunosuppression agents	Outline the use of proteinuria as a marker of glomerular injury and discuss clinical implications and therapies to reduce proteinuria	Summarize the important role of dietary and lifestyle changes in preventing stone disease	State common complications of dialysis especially infectious complications and management
						List the contraindications for kidney transplantation by evaluating potential donor and recipient with a nephrologist  Describe the team approach to caring for a dialysis patient (nephrologist, nurse, dietitian and social worker) by participating in dialysis rounds or interdisciplinary meeting
						Understand the importance of patient involvement and social support by caregivers in home dialysis training

(continued)

Table 1. Continued

Competency domain	CKD	Hypertension	Glomerular diseases	Hematuria and proteinuria	Nephrolithiasis	Dialysis therapies and transplantation
Systems-based practice	Discuss options for renal replacement such as dialysis, transplantation or conservative management in patients with CKD stages 4 and 5					
Communication and interpersonal skills	Demonstrate competency to explain the basics about the diagnosis and stages of CKD (based on eGFR and albuminuria)	Counseling on lifestyle and dietary changes (sodium, potassium or phosphorus restriction as appropriate)				Understand the process of organ allocation in kidney transplantation

ACE-I, angiotensin-converting enzyme inhibitors; ARB, angiotensin II receptor blockers; eGFR, estimated glomerular filtration rate; NSAID, nonsteroidal anti-inflammatory drugs.

50% of the residents who underwent the pure inpatient elective [13]. Survey of the IM residents at the end of the study also revealed that those who experienced outpatient nephrology enjoyed the interaction with attendings and reported greater satisfaction than those who rotated only in the inpatient side.

It is hoped that with enhanced learning afforded by outpatient nephrology experiences, the common perceptions of IM residents toward nephrology (such as 'dialysis patients being too sick') is likely to change. Working with more attending faculty members as a result of the rotation design would allow different perspectives on nephrology careers to be shared and may also open up avenues for research collaboration such as quality improvement projects on CKD education or advanced care planning, thus overall benefiting the IM resident in their professional career. Also, an inpatient-based elective may well not expose the trainee to other career options that are available following nephrology fellowship training. However, a well-designed representative elective that includes both inpatient and extensive ambulatory (clinic, outpatient dialysis and transplantation) experiences would expose IM residents to additional nephrology career options that they may have never considered, such as transplant nephrology, medical directorship of a dialysis or transplant center, and interventional nephrology.

### Incorporating outpatient nephrology experiences during medical residency

#### The University of Vermont Medical Center nephrology elective experience

The Division of Nephrology and Hypertension at the University of Vermont Medical Center (a 562-bed hospital in Burlington, VT) has nine clinical nephrologists and two transplant nephrologists providing inpatient and outpatient nephrology services (clinics and free-standing dialysis units). Prior to 2014, the 2-week nephrology elective for IM residents was purely inpatient. The resident would round with one hospital attending and be a part of the inpatient consult team that included fellows and medical students. Resident learning in the elective was limited to bedside teaching and nephrology case conferences.

The initiative to incorporate outpatient nephrology curriculum into the resident's education began in early 2014. Meetings with the nephrology division faculty, IM residency program director, chief medical residents and the education committee helped garner interest in this initiative. Various options of the rotation structure were considered including the nature of the rotation (elective versus mandatory), presence of half-day versus full-day clinics and a purely outpatient versus inpatient-outpatient design. Consensus was also obtained for making it mandatory for every IM resident to rotate in nephrology. We also chose not to have any half-day clinics during the inpatient rotation as this structure would have likely affected the learning and continuity of patient care, especially during the inpatient rounding. Hence, the 2-week rotation was equally divided into 1 week of full-day outpatient clinics and 1 week of inpatient rounding (Figure 1A). Residents would see new and established patients under supervision of the assigned attendings in the general nephrology clinic. We provided an electronic medical record template for data collection, presentation and to complete patient notes. Residents were also assigned to see patients in the stone clinic with either the urologist or the nephrologist. Outpatient hemodialysis rounds (that included a visit to the home program when possible) were included in the outpatient week. To enhance the overall learning experience, formal

		Monday	Tuesday	Wednesday	Thursday	Friday
Week 1	AM	Inpatient service	Inpatient service	Inpatient service	Inpatient service	Urgent clinic
	PM	Inpatient service	Inpatient service	Inpatient service	Inpatient service	Inpatient service
Week 2	AM	Outpatient clinic	Outpatient dialysis (in-center and home dialysis)	Outpatient clinic	Outpatient clinic	Urgent clinic
	PM	Dialysis RN to teach HD	Outpatient clinic / stone clinic (every 3rd week)	Transplant clinic	Outpatient clinic	Resident presentation
		Outpatient clinic				Inpatient service Feedback

A. Two-week Nephrology rotation for IM residents at University of Vermont Medical Center.

		Monday	Tuesday	Wednesday	Thursday	Friday
Week 1	AM	Meeting with Nephrology Elective Director	Inpatient rounds	Inpatient rounds	Inpatient rounds	Inpatient rounds
		Inpatient rounds				
	PM	Inpatient rounds	Inpatient rounds	Inpatient rounds	Journal club	Inpatient rounds
Renal grand rounds		Case conference	Core conference	Inpatient rounds		
Week 2	AM	Inpatient rounds	Inpatient rounds	Inpatient rounds	Inpatient rounds	Inpatient rounds
	PM	Inpatient rounds Kidney biopsy conference	Inpatient rounds Case conference	Inpatient rounds Core conference	Inpatient rounds Journal club	Inpatient rounds
Week 3	AM	Transplant clinic	Nephrology clinic	Nephrology clinic	Transplant clinic	Meetings with division chief and researchers Transplant meeting
	PM	Nephrology clinic Renal grand rounds	Nephrology clinic Case conference	Nephrology clinic Core conference	Outpatient hemodialysis	Nephrology clinic
Week 4	AM	Peritoneal dialysis clinic	Transplant clinic	Nephrology clinic	Nephrology clinic	Outpatient hemodialysis
	PM	Nephrology clinic Research conference	Outpatient hemodialysis Case conference	Peritoneal dialysis clinic Core conference	Nephrology clinic	Evaluation meeting with Nephrology elective director

B. Four-week Nephrology elective for IM residents at North Shore University Hospital and Long Island Jewish Medical Center.

		Monday	Tuesday	Wednesday	Thursday	Friday
Week 1	AM	Inpatient rounds	Inpatient rounds	Nephrology clinic	Inpatient rounds	Inpatient rounds
	PM	Inpatient rounds	Nephrology clinic	Inpatient rounds	Journal club	Inpatient rounds
		Renal grand rounds	Case conference	Core conference	Outpatient hemodialysis	
Week 2	AM	Transplant clinic	Inpatient rounds	Nephrology clinic	Inpatient rounds	Inpatient rounds
	PM	Inpatient rounds Kidney biopsy conference	Peritoneal dialysis clinic Case conference	Inpatient rounds Core conference	Journal club Nephrology clinic	Inpatient rounds

C. Two-week Nephrology elective for IM residents at North Shore University Hospital and Long Island Jewish Medical Center.

Fig. 1. Structure of the nephrology rotation for medicine residents at University of Vermont Medical Center (A) and Northwell Health (B and C). (A) Residents are expected to participate in the medicine morning report, noon conference, medicine grand rounds and nephrology fellows case conference, and these are not represented in the figure. Residents are also asked to attend the monthly kidney biopsy pathology conference (every fourth Monday) and nephrology division journal club (every fourth Thursday). (B and C) Residents at Northwell Health may either choose the 4-week or the 2-week nephrology elective. RN, registered nurse; HD, hemodialysis.

presentation of an assigned nephrology research paper was required. The IM milestones and the faculty evaluation form were revised to reflect competencies gained from outpatient nephrology. The newly designed rotation was initiated in March 2014 after receiving consensus and approval. At the beginning of each resident rotation, a schedule was created for each resident that listed the inpatient and outpatient assignments for the 2-week duration of the rotation. The resident schedules had to be individualized as attendings were occasionally unavailable because of other clinical or administrative responsibilities.

To evaluate this novel elective experience, online surveys were sent to 5 residents in June 2014 and 17 residents in June 2015, of which 100% and 64.7%, respectively, responded [14]. On average, residents worked with four attendings. Free text

comments by residents were mostly favorable (Table 2). Time to travel to the dialysis unit and clinic (10–15 min) was not considered burdensome by the residents. All residents found the topic for the assigned PowerPoint (nephrology research article) talk to be clinically relevant. Internal surveys by the IM residency program confirmed similar findings.

**The Northwell Health nephrology elective experience**

At the North Shore University Hospital and Long Island Jewish Medical Center (two large tertiary care teaching facilities of the Northwell Health, with 18 nephrology faculty), the 4-week nephrology elective for IM residents was initially restructured in 2010 (Figure 1B). The goal was to provide residents with a richer

**Table 2.** Responses from residents at University of Vermont Medical Center to the survey question ‘Any thoughts or comments on the Nephrology rotation?’

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‘I think it was probably the most organized rotation I have gone through during my residency. I would have liked a bit more time. I would have also liked to actually do a home visit with the Home Dialysis program.’

‘I liked it—It exposed me to the outpatient side of nephro. It would have been cool to have seen more HTN, since that is so prevalent. Fellows and attendings were all cool to work with.’

‘It was great! I learned a lot and had a great time! The faculty loves to teach and everyone took time to do so! I wish I would have had the rotation earlier in my residency training.’

‘I enjoyed the nephrology rotation. I felt that the attendings were warm and welcoming. Even though it was a short rotation, I feel that it was a valuable experience.’

‘Really liked having both inpatient and outpatient experience particularly renal transplant clinic and Joy drive [outpatient dialysis unit].’

‘Much better than it used to be. I felt like I was part of the team. the support staff especially at clinic were wonderful.’

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HTN, hypertension.

educational experience than a traditional pure inpatient-based elective. The restructured 4-week elective that was developed includes a pure 2-week inpatient consultative/dialysis experience and a dedicated 2-week extensive outpatient experience. During the outpatient elective time, IM residents experience various renal clinics, including CKD, hypertension, peritoneal dialysis and kidney transplant. In addition, they round with either a fellow or faculty member, or both, in the outpatient hemodialysis clinic several times during the elective. They also get to meet and discuss basic and clinical research studies with faculty members. Residents are also exposed to several faculty members with diverse interests and areas of expertise. Our experience with this elective in comparison with a traditional inpatient-based elective suggests that the combined elective format is perceived favorably by IM residents [13]. In addition to participation in divisional conferences (case conference, renal grand rounds, biopsy conference, journal club and core lecture) during the elective, residents are also assigned a topic in nephrology to read and prepare for presentation to both fellows and faculty. They are encouraged to present the assigned topic using non-traditional teaching tools [15, 16]. This presentation is given before the end of the rotation.

Besides the 4-week elective as described above, the 2-week pure inpatient nephrology elective that was also offered to IM residents prior to 2012 was restructured to incorporate several outpatient and educational nephrology experiences (Figure 1C). Presently, the IM residents have the option to experience either a pure 2-week outpatient nephrology elective or a combined 1-week pure inpatient and 1-week dedicated outpatient elective. The pure 2-week outpatient elective is more commonly chosen by IM residents who are interested in nephrology.

### Implications and future considerations

With all the above-described benefits of exposing IM residents to outpatient nephrology, we recognize that there may be several difficulties related to incorporating this experience during elective time. Strategies to overcome some of these challenges are listed in Table 3. IM residency program directors may sometimes feel the need to have residents work preferentially in the hospital setting because of the increased demands of inpatient subspecialty services. In fact, this was the most common reason cited on a survey by US nephrology program directors for the inability to offer outpatient nephrology experience to the residents [5]. While this remains an important concern, it is incumbent upon the training community to provide a true insight into the professional life of practicing nephrologists during elective time. While all of nephrology and what it has to offer

cannot be mastered in 2–4 weeks, we urge IM residency programs to work collaboratively with their clinician educators in nephrology and attempt to incorporate as much outpatient nephrology learning as possible.

Some clinical educators may argue that if career decisions are to be influenced, it is more important for medical students than residents to be exposed to outpatient nephrology. In a survey of 273 fourth-year medical students across five US medical schools, Rosner *et al.* reported that fewer than one-third of the students had any exposure to nephrology, thus lessening the probability of choosing a career in nephrology [18]. Interestingly, more than 40% of the surveyed students desired more outpatient exposure to nephrology [18]. Hence, incorporating outpatient nephrology experiences during medical student elective time is also important and should be strongly considered. Residents who are international medical graduates have their first exposure to nephrology practice in the USA during residency. As international medical graduates make up about 60% of the applicants who match into a nephrology fellowship, it is vital that appropriate exposure to outpatient nephrology occur in medicine residency [19].

Several IM residency programs may also have difficulty arranging outpatient nephrology experiences due to scattered practice locations such as outpatient clinics and dialysis units. Such programs should consider full-day clinics for their residents to minimize travel time. Use of online real-time streaming of live lectures such as resident noon conferences is likely to avoid residents missing out important educational content without wasting time on travel.

Finally, we would encourage the training community to make creative attempts to expose their IM residents to other educational and clinical activities in nephrology. Interventional nephrology is a field that is likely to appeal to residents interested in performing procedures and may be an attractive option to increase interest in nephrology [20]. A visit to the interventional nephrology suite, such as in an outpatient vascular access center, and allowing observation of procedures to establish or maintain vascular access may be considered based on the setup. Another opportunity would be to expose IM residents to the field of kidney transplantation during their residency. A well-planned 2- to 4-week elective in kidney transplantation would be an exciting option for interested IM residents, where they could learn about the organ allocation process, donor-recipient evaluation, follow-up of kidney transplant patients and an opportunity to interact with the surgeons on inpatient rounds or transplant committee meetings. Teaching bedside ultrasound to evaluate the kidneys, urinary bladder and methods to assess volume status is an exciting skill to teach residents as there is likely to be more demand for point-of-care ultrasound in the future [21, 22].

Table 3. Strategies to incorporate outpatient nephrology into the IM residency program

1. **Identify rotation director:** We recommend that one nephrology faculty member take a leadership role as the nephrology rotation director and create the outpatient nephrology curriculum.
2. **Determine educational opportunities:** Identify all possible opportunities for outpatient experience based on the practice size, nature of clinics (general nephrology clinics or specialized clinics such as stone, hypertension or glomerulonephritis clinic) to meet as many of the learning objectives as possible.
3. **Identify teaching faculty:** Identify interested faculty members who are willing to supervise and teach IM residents in the outpatient nephrology setting and who do not have schedules that conflict with other responsibilities.
4. **Design the rotation and its inner workings:**
  - (i) Create a structure of the rotation that works both for the IM resident and the nephrology faculty. Consider options such as dividing the rotation equally between the inpatient and outpatient settings or having a purely outpatient rotation. If practice locations are scattered, ensure minimal travel time for the resident.
  - (ii) Present the rotation structure/curriculum to the nephrology faculty members and address any concerns or conflicts. Review the time and efforts that faculty members would need to put in and explain the importance of interacting with residents. Suggest teaching strategies for effective teaching in the clinic [17].
  - (iii) Create the rotation schedule that clearly lists the outpatient assignments to the resident. Have a backup plan (such as inpatient rounding) if some attendings are unavailable in the clinic. If possible, avoid having more than one resident in the clinic to allow one-on-one interaction with the attending and avoid overcrowding.
  - (iv) Present the rotation schedule to the leadership in the medicine residency program. Address any concerns regarding replacing the traditional inpatient format with outpatient nephrology and obtain approval. Update the milestones for resident evaluation.
  - (v) Obtain administrative support for the medicine residency and nephrology division. Inform the program coordinators to keep track of the resident schedules and changes.
  - (vi) Set a start date for the new nephrology rotation.
5. **Discuss expectations of the rotation with the resident:**
  - (i) At the beginning of the rotation, provide the resident with a clear schedule with dates, times and locations to avoid confusion (may use online tools for personalization such as Google calendar). Avoid conflict with other IM residency conferences such as noon conferences and morning report. Send the learning objectives, curriculum, schedule and any assigned papers to the resident prior to the rotation. The nephrology rotation director should also consider reviewing the schedule structure with the resident either over the phone or in person prior to the beginning of the rotation.
  - (ii) Consider having an assigned review or journal club presentation for the resident to have an understanding of research and development in nephrology.
6. **Assess outcomes:**
  - (i) Feedback should be provided to internal medicine residents at the end of the rotation by the elective director who should solicit input from the inpatient and clinic attendings (prior to this meeting).
  - (ii) Survey the residents every 6 months or at the end of the year. Review results of the Accreditation Council for Graduate Medical Education or internal surveys to ensure that the rotation is working for the IM residency and identify areas for improvement.

IM, internal medicine; ACGME, Accreditation Council for Graduate Medical Education.

Training programs should consider providing an additional 2- to 4-week purely outpatient-based nephrology elective for IM residents, especially to those who have an interest in the field or if there is concern that the educational experience with the inpatient-outpatient rotation is superficial. Educational activities (such as creative writing, academic newsletter or crosswords) to keep the residents engaged during the rotation should also be considered. Further educational research studies are needed to understand the impact of outpatient nephrology rotation design on resident learning and career choices.

In conclusion, while there will be several challenges, we believe that incorporating outpatient nephrology experiences during IM residency can potentially enhance resident learning and interest in nephrology. The ambulatory care exposure during the nephrology rotation offers IM residents new learning opportunities in patient care, medical knowledge and systems-based practice in outpatient nephrology, and allows interaction with several more nephrology attendings than a purely inpatient-based rotation, thus increasing mentorship opportunities. Hence, IM residency programs and the training nephrology community should strongly consider incorporating outpatient nephrology curriculum based on the feasibility, resources and support available to them. While several factors play a vital role in an IM resident's career choices, exposure to outpatient nephrology during medical residency will allow the resident to

make a better-informed decision regarding whether nephrology is the right career choice for them.

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## Conflicts of interest statement

None declared.

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