Rapid changes are occurring in the healthcare environment, with greater emphasis placed on the care experience, its value/cost, and health outcomes. These changes are outpacing educational reforms, leading to growing gaps between medical education and clinical practice. Particularly concerning is trainee readiness for such gap areas as systems redesign, quality improvement and patient safety, population health, and interprofessional practice. Medical education must continue to evolve to address these gaps, and nephrology is at the cutting edge of these transformations.

Greater attention is being paid to the continuum of medical education and the competencies needed to advance from undergraduate medical education (UME; medical students) to graduate medical education (GME; residents and fellows) to clinical practice. Competency-based assessment of entrustable professional activities such as ability to perform a history and physical, or form a differential diagnosis, is becoming the preferred method of assessing performance. As a consequence there is a move from the traditional block rotation of clinical clerkships to more longitudinal clinical experiences.

The classic Flexnerian model of UME with two years of foundational knowledge (anatomy, genetics, biochemistry, histology, and others) followed by two years of clinical education, is changing to earlier and more meaningful clinical education experiences, a shorter time for learning the foundational knowledge, and greater integration of basic and clinical science across all years of medical school. Incorporating public health, health policy, quality improvement, and interprofessional practice into the curriculum is narrowing gaps between medical education and clinical practice.

Integrating basic and clinical science

Nephrology exemplifies how the understanding of basic science can greatly inform the clinical approach to patients. For example, understanding the action of antidiuretic hormone in the cortical collecting duct, or the trafficking of aquaporin 2 can inform the differential diagnosis of diabetes insipidus or the approach to hyponatremia. Part of the teaching of clinical fluid and electrolyte disorders is simultaneous re-education in renal physiology. Similarly, renal histology informs the interpretation of kidney biopsies, and understanding the basics of complement regulation can help with the approach to glomerulonephritis.

Focusing on population health

In the US, funding for the treatment of patients with end-stage renal disease (ESRD) is unique in that every American with kidney failure is eligible for Medicare coverage under the Medicare End-Stage Renal Disease (ESRD) Program, regardless of age or income. As a consequence, ESRD is a disease that is monitored closely. The United States Renal Data System (USRDS) established in 1988 is the national data registry that collects, analyzes, and reports information on ESRD patients in the US. USRDS reports on the epidemiology of ESRD including incidence and prevalence, trends in mortality, and demographic characteristics of the ESRD population. This data enables investigation into relationships among demographics, treatment modalities, and clinical outcomes.
Nephrology was one of the first specialties to develop to improve patient safety. Applying quality improvement measures, and accountable care into practice.

The costs for Medicare coverage of ESRD have increased with the growth in numbers and increased in complexity. ESRD beneficiaries comprise <1% of the Medicare population but account for about 7% of total Medicare spending. Unique opportunities and motivations exist to test new models of payment and care for ESRD patients.

The Monthly Capitated Payment (MCP) codes that compensated nephrologists for the outpatient care of dialysis patients was the first bundled or "global" physician payment structure and model today's shift toward global payments. The ESRD Prospective Payment System (PPS) implemented in 2011 provides a single payment to ESRD facilities for renal dialysis services. This is the first fully bundled (with the exception of certain oral-only medications) mandatory payment system, intended to keep costs down by shifting risk and reward to providers. The Quality Incentive Program (QIP) was the first mandatory "pay-for-performance" system designed to promote high quality care of dialysis patients. The ESRD Seamless Care Organization (ESCO) program is a new payment and service delivery model launched in 2015. This is the first disease-specific accountable care model. In the ESCO, coordinated care is provided for beneficiaries by dialysis clinics, nephrologists, and other providers. ESCOs are accountable for both clinical and financial outcomes.

Nephrology has also broken ground in the area of chronic care. The Emergency Medical Treatment and Active Labor Act (EMTALA) requires hospital Emergency Departments that accept payment from Medicare to provide appropriate medical screening examination to patients seeking treatment regardless of citizenship, legal status, or ability to pay. When such treatment is administered there are no provisions for reimbursement. For undocumented immigrants with ESRD, EMTALA requires that patients receive dialysis as an emergency measure. In some states, patients rely on emergency dialysis care as a routine way of getting access to dialysis. Nephrologists are confronted with conflicting mandates of trying to provide high quality, high value care but bound by the limitations raised by the undocumented immigrant status of patients.

Applying quality improvement measures to improve patient safety

Nephrology was one of the first specialties to develop clinical practice guidelines with the Kidney Disease Outcomes Quality Initiative (KDOQI) and the international Kidney Disease Improving Global Outcomes (KDIGO) evidence-based care algorithms. Clinical performance measures have informed quality improvement, public reporting, and payment. In the dialysis unit, an interprofessional team reviews clinical performance measures and designs quality improvement projects to improve these measures and hopefully downstream patient outcomes. The Centers for Medicare and Medicaid Services (CMS) publishes dialysis facility metrics on Medicare.gov—Dialysis Facility Compare (www.medicare.gov/dialysisfacilitycompare/) providing quality data for patients, providers, and the public to review. Facilities are rated up to 5 stars for such outcomes as hospitalizations, mortality, transfusions, dialysis adequacy, serum calcium, the use of arteriovenous fistulas, and length of time a dialysis patient is in place. As discussed above, the ESRD Quality Incentive Program (QIP) is the first pay-for-performance program in a Medicare prospective payment system.

Improving treatment through interprofessional practice

Models of healthcare delivery are evolving from individual practitioner-patient interactions to team-based care. Health professional schools are working to incorporate principles of interprofessional education and practice into the curriculum.

In fact the Liaison Committee on Medical Education (LCME) that sets the accreditation standards for medical schools in the US has implemented a standard for interprofessional education stating "the core curriculum of a medical education program must prepare medical students to function collaboratively on health care teams that include other health professionals. Members of the health care teams from other health professions may be either students or practitioners...". Nephrology is a model specialty to teach health professional students about team-based care; it has successfully applied interprofessional practice for many years. Care of the CKD patient requires a coordinated approach by multiple caregivers in addition to the nephrologist. Dieticians, pharmacists, nurses, advanced practice providers, social workers, dialysis technicians, psychologists, and others all actively participate in care of the CKD patient. In fact, an interdisciplinary team approach to care is required in the Conditions of Coverage for dialysis units that dictate the minimum health and safety rules that all Medicare and Medicaid participating dialysis facilities must meet.

The chronic care model: Improving outcomes and putting patients at the center of care

The chronic care model integrates community, health system, self-management support, delivery system design, decision support, and clinical information systems to manage chronic disease. The approach incorporates patient, provider, and system level interventions with a major focus on the patient being at the center of care. This model has been applied in nephrology in the form of the CKD Clinic. Advanced Chronic Kidney Disease Certification process through the Joint Commission and the Emergency Care Organization (JCAHO) is available for recognizing CKD Clinics that have met JCAHO standards. Studies have demonstrated improved outcomes when CKD patients are in interdisciplinary clinicians including better adherence to clinical practice guidelines, reduced hospitalizations, improved survival, decreased progression, and higher placement rate of arteriovenous fistula.

Integrating palliative care into clinical practice

ESRD is a life-limiting illness requiring an intentional and proactive approach to care decisions. For patients with CKD, advanced care planning can align treatment goals with patient preferences before there is a healthcare crisis in which the patient may be impaired and unable to make a decision. Critical issues, especially whether the patient wants dialysis, need to be addressed and are a model for shared decision making, emphasizing the need to inform patients about the risks and benefits of treatments taking into account the patient's values, preferences, and life goals.

Delivering care to remote locations

Strategies are needed to improve care of patients with chronic disease especially those in more remote locations. This care should reduce adverse health outcomes, provide a timely and convenient care experience for patients no matter their location, and be of high value with the potential to reduce overall health system costs. Telehealth is an example of such a strategy. It has been used, with or without case management, in various forms to manage patients with chronic illnesses including heart failure, chronic obstructive pulmonary disease, and diabetes mellitus. Despite its growing use, telehealth outcomes have been variable, and its expense is often considerable, emphasizing the need to carefully assess its effectiveness.

The use of telehealth in nephrology to manage patients with CKD was the subject of a recent randomized controlled trial performed at the Minneapolis VA Health Care System (Am J Kid Dis 2016, in press). In this trial, delivery of health care by an interprofessional team using telehealth could be effectively implemented for both rural and urban patients, but did not reduce the risk of death, hospitalization, or emergency department visits, or admission to skilled nursing facilities compared with usual care. While the overall study was negative, rural patients may be a select subgroup in which the use of telehealth and interprofessional care may offer benefits, particularly in areas that are scarce in subspecialty care. Telehealth may be an effective strategy for following patients in rural dialysis units, as support for home dialysis therapies, and for routine follow-up of kidney transplant recipients.

Conclusions

Healthcare today is evolving rapidly, and medical education must keep pace and prepare students and trainees to enter today's healthcare environment and advance future care. Nephrology continues to stay ahead of the curve. The success nephrologists have had incorporating change can be applied to more effectively connect medical education to the delivery of high quality, patient-centered care.