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February 10, 2017

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Via Federal Express

Ms. Kathryn J. Olson  
Chair  
Illinois Health Facilities and Services Review  
Board  
525 West Jefferson Street, Second Floor  
Springfield, Illinois 62761

**Re: Foxpoint Dialysis (Project No. 16-037)  
Additional Information**

Dear Ms. Olson:

We represent DaVita, Inc. and its subsidiary, Total Renal Care, Inc. (collectively, “DaVita”). At the Illinois Health Facilities and Services Review Board (“HFSRB”) January 24, 2017 meeting, DaVita deferred consideration of the Foxpoint Dialysis CON application in order to provide additional information based on certain questions that were raised during the hearing regarding accessibility to services at other locations outside of Granite City. Before we provide that additional detail, I want to point out that this project is unopposed and will provide access to life-sustaining dialysis treatments for residents of Granite City which, today more than ever, is an economically disadvantaged community. This is further discussed below.

The Foxpoint Dialysis facility project is a proposal to expand the Applicant’s delivery of hemodialysis services in Granite City, Illinois. If DaVita does not add the additional services in Granite City, dialysis care will be more costly to the State of Illinois due to increased expenses for transportation furnished as a Medicaid benefit to transport patients to other communities for care. About 50% of patients in the Granite City dialysis facility rely on such state-funded transportation for their treatments three times a week. If the Granite City facility is built, the cost of dialysis care itself to the state and federal governments and other payors will be the same based on the fixed rate paid for these services regardless of the location. However, due to a significant extent to Medicaid funding issues, denying Granite City residents immediate access to dialysis services would hurt not just the patients and families but the State budget which is already in crisis due largely to Medicaid funding issues.

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## I. Need for Services in Granite City

### A. Granite City Economic Difficulties

Granite City is a community to the northeast of St. Louis just across the river from St. Louis. It was founded for the operation of a tin stamping and enameling company along with a steel plant just before the turn of the 19<sup>th</sup> century. The steel mill has been the primary employer in the area for many years. Unfortunately, the operations of the steel plant have been idled for most of the last two years by U.S. Steel, the current operator. U.S. Steel plans to re-open parts of the mill this month but most of the 2000 workers laid off will remain unemployed. See the St. Louis Post Dispatch article dated November 27, 2016 and the Belleville News Democrat article dated December 19, 2016 attached as Attachment – 1, which describe the steel mill’s status as well as associated unemployment relating to the idling of the steel mill. Ultimately, the steel industry has been faltering in the U.S. and prospects for the longevity of the mill in Granite City are uncertain. There are several other businesses tied to the steel industry including trucking firms and businesses that help maintain the plant. The idling of the steel mill is having a domino effect reaching beyond the workers laid off by U.S. Steel. In fact, according to USW Local 1899, the local steelworker’s union, the loss of one steel worker’s job affects 7 other jobs in Granite City. Some other communities that previously relied on heavy industry have had success revitalizing their economies with service-sector focused positions for its labor force. Granite City has not had meaningful success diversifying its economy in the years following that decline. Because a very low percentage of the population has a college degree - less than 15% - it is particularly difficult for people in the community to get retraining for gainful employment.

Associated with the hardships of a failing company town, there are several indicators that demonstrate the economic difficulties of the community. The median per capita income is only 77% of the median for Illinois (\$23,552 vs. \$30,494).<sup>1</sup> 11.5% of the population of the community has no health insurance compared with 8.1% statewide.<sup>2</sup> At the existing Granite City Dialysis facility operated by DaVita, only 7% of patients receive insurance benefits from non-government payors. That means 93% rely either on Medicaid or Medicare benefits. This is very high compared to other communities in the state. The state-wide payor mix for in-center hemodialysis facilities is a combined 74% Medicare/Medicaid. As for employment status, as of the date of this letter, only three individuals of nearly 100 patients are employed which means that patients almost exclusively rely on disability insurance, social security and pensions or on

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<sup>1</sup> QuickFacts Census, United States Census Bureau, United States Department of Commerce.

<sup>2</sup> Id.

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their family for support. They have very limited incomes to receive any services that are not covered by insurance. Chronic illnesses like chronic kidney disease disproportionately and negatively impact individuals living in socio-economically disadvantaged communities like Granite City. (See Attachment – 2.)

B. Growth in Demand for Dialysis Services in Granite City

With regard to the growth in need for dialysis services, as DaVita previously documented, the growth in demand has been dramatic and beyond what DaVita has seen in other markets. Patient census among the existing facilities in the area that had capacity to grow has increased approximately 7% annually over the past three years, with each facility seeing double digit increases over the period from 2013 to 2016.

This growth is attributable to the rise in the prevalence of CKD and better outcomes and mortality for ESRD patients receiving treatment. African-Americans, Hispanics and low-income individuals are disproportionately affected by kidney failure. According to the most current data, African-Americans are 3.5 times more likely to develop ESRD than Caucasians, and Hispanics are 1.5 times more likely to develop ESRD than non-Hispanics. Within some sub-communities, individuals with incomes of less than \$20,000 are 3 times more likely to develop ESRD than those earning over \$75,000.

As stated during the January 24, 2017 meeting, DaVita provides home dialysis support services for both peritoneal and home hemodialysis patients. DaVita's Granite City Dialysis provides home training services to the Granite City population. The HFSRB members and staff may not be aware of the prevalence of home dialysis and training support service because these services are not regulated by the HFSRB. However, in Illinois, DaVita operates approximately 50 home training and support facilities in Illinois and other providers also put a significant investment into this alternate treatment modality. Despite the availability of these resources, only 7% to 8% of patients elect a home dialysis modality even after encouragement of their nephrologist and the facility social worker. In socio-economically disadvantaged communities, this figure is even lower.

Kidney transplant is the preferred modality; however, only a limited number of kidneys are available, and the wait for a transplant is 3-5 years. Further, many patients are ineligible for

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a kidney transplant.<sup>3</sup> Finally, monthly testing necessary to remain on the transplant list discourage otherwise eligible patients to enroll and to remain on the transplant list.

C. Lack of Early Detection of CKD

Kidney failure is often referred to as a “silent disease” because symptoms do not manifest themselves until the later stages. As a result, it can go undiagnosed until it has advanced to a point when kidney failure is imminent. Individuals who do not have a medical home or who otherwise do not regularly see a doctor are more vulnerable to being diagnosed with late-stage kidney disease when it is too late to try intermediate treatments – medications and lifestyle interventions. Such interventions could have maintained the patient’s kidney function for some period of time, potentially years, without dialysis.

In the U.S., the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) reports that one in 10 American adults has some level of CKD.<sup>4</sup> The incidence of recognized CKD in people aged 65 years or older more than doubled between 2000 and 2008, from approximately 1.8% to approximately 4.3%.<sup>5</sup> See Attachment – 3, which provides additional information regarding the epidemiology and prognosis of CKD. With a lack of primary care resources in the community, health planners must anticipate volume will continue to increase for the foreseeable future. Because patients with CKD stages 1-3 are generally asymptomatic regular blood testing that is part of annual preventative medicine is essential for early diagnosis and treatment. Without meaningful primary care, the early stages, when the progression of the disease is easier to manage, go undetected. Instead, many patients are far along in the progression of CKD due to the lack of health care access prior to diagnosis of CKD

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<sup>3</sup> Factors affecting eligibility include: (1) noncompliance with medical treatment including a reluctance to follow a dialysis schedule, such as missing sessions or signing off early against medical advice; (2) active drug and/or alcohol abuse; (3) insufficient social support; (4) uncontrolled or untreated psychiatric condition; (5) other active illness(es) that would compromise the success of the transplant, such as severe heart disease, severe peripheral vascular disease, infection, obesity, recent malignancy, and limited physical mobility without the likelihood for successful rehabilitation.

<sup>4</sup> United States Renal Data System. Chapter 1: CKD in the General Population. *2015 USRDS Annual Data Report: Epidemiology of Kidney Disease in the United States*. Bethesda, MD: National Institute of Diabetes and Digestive and Kidney Diseases; 2015

<sup>5</sup> Id.

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or even ESRD. As a result, the CKD data used to support this and other dialysis projects only captures patients identified with CKD and therefore does not fully represent CKD prevalence. The proposed facility's referring physician has to devote significant time each week attending to these previously undiagnosed patients who, due to previously undiagnosed ESRD, are "crashing" in the emergency department of Gateway Regional Medical Center, the Granite City Hospital.

DaVita is working to improve identification and management of CKD in the primary care setting. DaVita hopes to make inroads into this health care epidemic by initiating its Kidney Smart programs at local federally qualified health centers ("FQHC") in the area. Kidney Smart is a comprehensive, interactive CKD program taught by certified CKD educators. Patients are taught: (1) importance of avoiding factors leading to accelerated progress of CKD; (2) natural disease progression; (3) potential benefits and adverse effects of prescribed medications; (4) avoidance of nephrotoxins; (5) diet; (6) renal replacement treatment modalities, including home dialysis, hemodialysis, and transplantation; and (7) permanent vascular access placement.

## **II. Service Area Developments and Transportation**

### **A. Other Facilities Under Development**

The primary concern raised about the proposal by HFSRB members at the January meeting is the possible option for patients residing in Granite City to leave Granite City and utilize facilities under construction in other Madison County or St. Clair communities. There are two core problems with this option: (1) the other facilities are dedicated to other patients and (2) patients barriers to transportation.

To help HFSRB members fully understand why these other facilities are not an alternative for the Granite City patients, below is a discussion of the justification for recently approved dialysis facilities as presented to the HFSRB when these projects were considered. It is important to understand each of these facilities will serve a distinct patient base and that the need for these other facilities was demonstrated with different CKD patients being treated by other nephrologists in the Metro East region. As shown in the table below, different nephrologists have committed to referring patients to the other planned facilities and all four facilities will achieve the State Board's 80% utilization standard by the time the proposed Foxpoint Dialysis is operational.

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Facility	Referring Physician	CKD Patients	Projected Patients	Projected Utilization
Sauget Dialysis	Rashid Dalal, M.D.	83	58	95%
FMC Belleville	Matthew Koch, M.D.	72	58	80%
O'Fallon Dialysis	Rashid Dalal, M.D.	99	59	82%
Collinsville Dialysis	Sriraj (Tim) Kanungo, M.D.	122	42	88%

Further, as shown on the patient service maps attached at Attachment – 4, each facility has a distinct patient service area. Sauget Dialysis serves primarily East St. Louis. Collinsville Dialysis will serve those communities on the east and northeast side of the Metroeast area. O'Fallon Dialysis will serve communities on the southeast edge of the Metroeast area. FMC Belleville will serve communities in the southern part of the Metroeast area. Finally, Foxpoint will almost exclusively serve patients in Granite City. The map showing these distinct service areas is reflective of sound health planning on the part of the area operators who are spacing the small facilities in areas to ensure that people burdened by routine and exhausting dialysis treatments have care in an area that reduces travel demands which cost both families and the State of Illinois time and money.

**B. Need for Additional Stations**

Over the broader planning area, beyond the Granite City community, there is a technical excess of dialysis stations. Despite this, there is a tremendous need for additional stations within a 30 minute drive of the proposed Foxpoint Dialysis, as demonstrated by the rapid growth in the existing facilities and because of the silent epidemic of chronic kidney disease in these communities which is truly in need of more affirmative action by the local health organizations.

As of September 30, 2016, the facilities in other communities around Granite City collectively operated just below the State's 80% target utilization standard. Related to that, the ESRD patient census within the service area increased 23% from 2013 to 2016. Importantly, the growth experienced in the Foxpoint service area is nearly twice that of the Statewide average during the same period.

Assuming this trend continues, there will be 960 ESRD patients in the service area by 2018 when the proposed Foxpoint Dialysis is scheduled to open. This translates to a need for 200 dialysis stations to accommodate these projected ESRD patients.

The projected growth in ESRD patients is further supported by the physician referral letters submitted for the four projects approved by this Board last year. Collectively, the

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physicians supporting Fresenius' new Belleville facility and DaVita's 8 station expansion of Sauget and its new facilities in O'Fallon and Collinsville project referring 231 ESRD patients. Based upon these referrals along with the Dr. Cheema's projected 58 referrals for Foxpoint, there will 1,072 ESRD projected patients by 2020 (2 years after Foxpoint becomes operational). This equates to a need for 223 stations. It is important to note that these are patients that are currently under a nephrologists' care and may need dialysis in the near future. There are hundreds of individuals who are undiagnosed and frequently are unaware they are suffering from kidney disease until they present to the emergency department in renal failure. Presently, there are 199 approved stations, which include the stations approved in 2016. This project seeks to add only 12 stations to the geographic service area which we believe is consistent with the actual need for dialysis stations if recent growth in patients is considered and despite the fact that other facilities are under development.

### C. Transportation Issues for Patients

Dialysis days are difficult and treatments often leave patients feeling tired, nauseous, and weak. In addition, many patients have co-morbidities or age related impairments that affect their well-being. Therefore, many patients rely on family, friends and caregivers to transport them to and from their dialysis treatment. Given the frequency of treatment and potential transportation access issues, it is important for quality of life that these facilities are proximately located to patients' homes. If facilities are too far from their homes, patients may have difficulty arranging transportation which can lead to missed treatments. Missing dialysis treatments increases co-morbidities - cardiac complications, stroke, fluid overload - and can result in costly hospitalization and death.

DaVita analyzed various transportation options for patients that would have to travel outside of the Granite City limits for their dialysis treatments if this facility is not approved. Public transportation is not feasible. Average travel time is 3.5 hours round-trip to access one of these other facilities and to get to certain facilities, patients could face more than four hours round-trip. Further, no existing facility is located near a bus stop, so patients, many of who rely on devices for ambulation, would be required to walk a considerable distance from the bus stop to the facility. Medicar services are available for Medicaid beneficiaries; however, those costs would be paid by the Illinois Medicaid program and would result in higher health care costs for the State of Illinois. For, non-Medicaid patients, paratransit services are available as an out-of-pocket expense; however, as shown in Attachment – 5, it would be cost prohibitive, particularly for patients living on government welfare programs and pensions or relying on family members for food and shelter.

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Only about 25% of patients at the existing Granite City facility drive themselves for treatment. Others rely on family if they are not eligible for Medicaid transport. Kidney disease is already having a devastating impact on these families' lives. Requiring families to bear the time and expense to seek out an available slot at a distant facility is short-sighted where demand demonstrates that more access is warranted in their immediate community. This is particularly true if the HFSRB considers that if DaVita does not add the additional services in Granite City it will be more costly to the State of Illinois due to increased transportation expenses to send those patients to distant facilities on the state's dime. The cost of dialysis care to the state and federal government and other payors will be the same based on the fixed rate paid for these services regardless of the location.

DaVita tries to locate its facilities in the center of where its patients reside, so services are more easily accessible to the most patients. As such, dialysis facilities are relatively small. In fact there are about 6,100 dialysis facilities nationwide. In this instance DaVita is planning 12 stations which would treat two groups of 29 patients a week. If it was physically possible, these services could be placed at the existing Granite City facility. That is not possible due to physical constraints. Ultimately, having two locations in a community that has demand for the stations provides more flexibility to the community it serves.

The proposed facility will be located approximately 3 miles (or 11 minutes) north of DaVita's existing Granite City facility which is the only other facility in the community. Its current census is 98 (81.6% utilized) is an increase of 20% over the last two years. As the census of this facility grows, it may need to operate four shifts a day rather than the standard three which is very difficult for staff and patients some of whom must stay until nearly midnight.

### **III. DaVita Business Model**

#### **A. Primary Services in Madison County**

As DaVita is able to capture overall use trends on a quarterly basis and manages its own patient census on a daily basis, DaVita's modeling facility development might not always pair up with the HFSRB's need projections. But its projections are based on actual current trends. Dialysis is not a "if you build it, they will come", type of service line. Dialysis is ONLY indicated when lab values for kidney function are in the range of ESRD and kidney function is so low that patient's cannot survive without treatment. DaVita's management is beholden to the company's shareholders and essential to ongoing financial performance of the company that it does not invest capital in facilities that are not needed.





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Thank for you for the opportunity to provide this additional information. We look forward to having the project considered again at the March 14, 2017 HFSRB meeting.

Sincerely,

A handwritten signature in cursive script that reads "Anne M. Cooper".

Anne M. Cooper

Cc: Cindy Emily  
Tim Tincknell

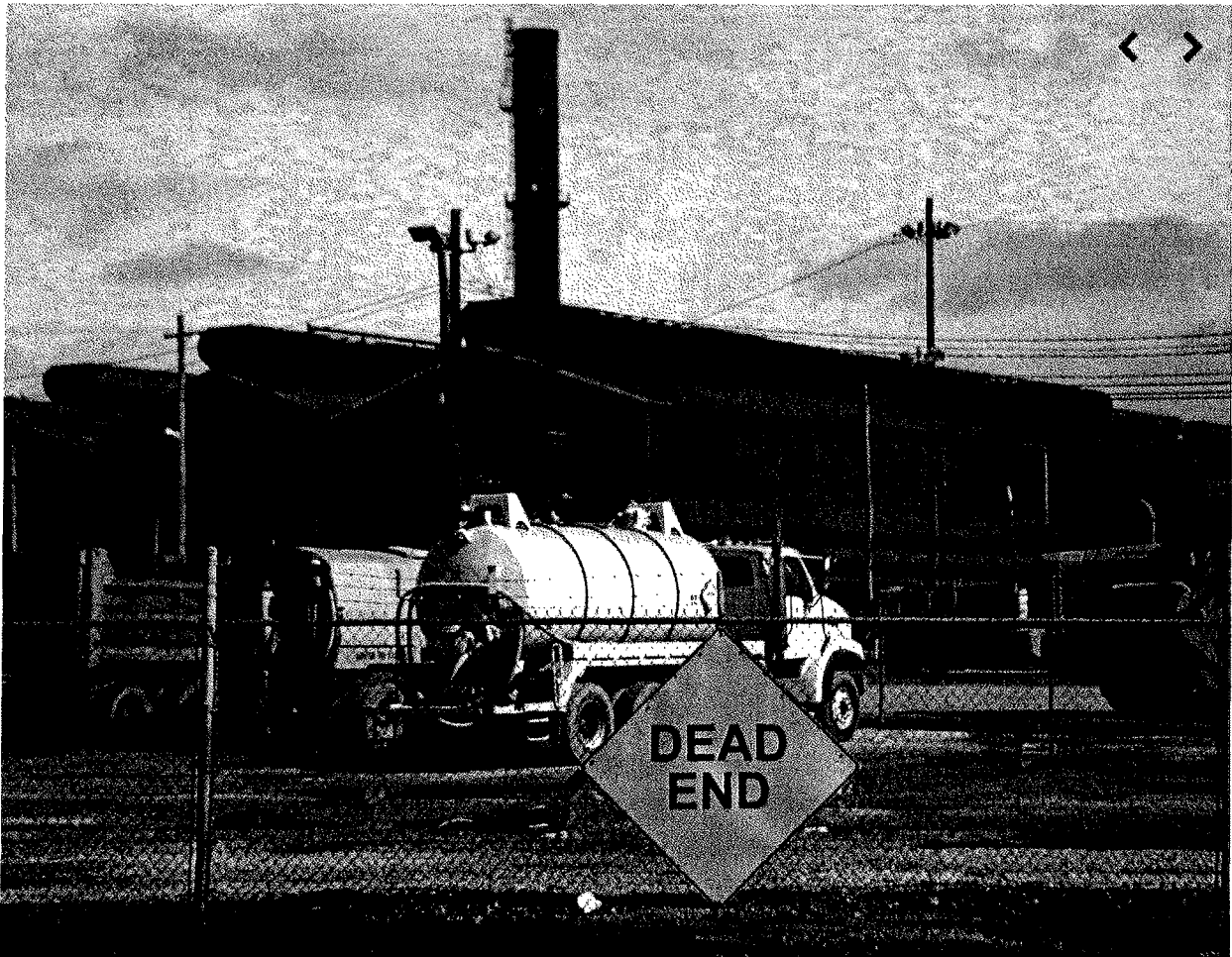
## Business

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### Laid-off steelworkers worry and wait in Granite City

By Jim Gallagher St. Louis Post-Dispatch Nov 27, 2016



A view of United States Steel Corp. from Washington Avenue, on Wednesday, March 25, 2015 in Granite City. The co announced it would temporarily idle its operations in Granite City and lay off more than 2,000 local workers. Photo Mach, hmach@post-dispatch.com

**GRANITE CITY** • The work was hot and dirty, but a job at the steel mill here offered a \$64,000-a-year ticket to the middle class for people who never went past high school.

Just about a year ago, United States Steel began canceling that ticket for some 1,500 people, laying off three-quarters of the mill's labor force.

Now, as a second winter without a paycheck approaches, many are worrying when and if they will climb back to the lives they knew. Granite City, an old-economy town that still lives by making things, is worrying with them.

"These were great manufacturing jobs. They paid very well. They became the American dream for young guys with a wife, young kids," said steelworker Jerry Halbrook, 53.

Casey Ballentine, 29, is one of those young guys.

Life was good when the mill was running. Most years, Ballentine could pull in \$75,000 with overtime. "I got up to \$92,000," he said.

Now, his unemployment has run out. He was just short of the three years of seniority at the mill needed to qualify for supplemental unemployment benefits (SUB) provided under the United Steelworkers' union contract.

Two weeks ago, he stood in a line for a free turkey at a giveaway for laid-off steelworkers at the Granite City township hall. He held 1-year-old Kyli in his arms as 5-year-old Harper circled around his legs. "I'm struggling to find a job," he said. "I have two little girls at home."

Few employers will pay \$75,000 to a high school graduate. Ballentine said he found work this summer at a lawn service, but that ended in October. His wife works at the front desk at a doctor's office.

"We're in credit card debt. It's 'do or die' now," he said. Little Harper, a daughter from a previous marriage, lacks health insurance, and it worries him.

What comes next? "I don't know," he said. He's hoping the mill reopens soon. "If not, it will be a way hard couple of years doing odds-and-ends jobs," he said.

U.S. Steel maintains that the partial shutdown is temporary. Nearly 500 people are still at work finishing steel made elsewhere. The big steel-making furnaces will start up again when orders return, the company says, although U.S. Steel hasn't hinted at when that might be.

The iffy nature of the situation is making it harder for steelworkers to find new jobs, workers say. Employers think they will quit when the mill reopens.

Other workers have different problems. "Not many people want to hire somebody with leukemia," said Mike Buckingham, 57.

Most cancer victims out of work since February would be in deep financial trouble, and Buckingham is feeling the strain. But his situation illustrates a point: If you have to be laid off, it's best to be a union steelworker. The United Steelworkers contract provides a cushion for older employees, and Buckingham has 37 years at the mill.

That qualifies him for two years of health insurance, plus \$2,200 a month in SUB pay. About \$300 of that goes for child support, and Buckingham is living with his elderly mother. "I'm barely making it," he said.

The amount of cushion depends on seniority, and SUB pay is reduced every few months. A large block of steelworkers will run out of SUB pay in December.

## Trade and Trump

Frustration led some steelworkers to break from their union, which supported Hillary Clinton for president. They were drawn to Republican Donald Trump's promise to crack down on unfair trade and put steelworkers back to work.

Halbrook, a steelworker for 27 years, always voted for Democrats. But this time he went for Trump. "A whole lot of people are getting tired of the system," he said. "This is the second time I got laid off under the Democrats."

Ballentine also picked Trump. "I know he's against unions, but unions don't matter if you don't have a job," he said.

"A lot of members are hurting, trying to make ends meet, trying to change careers," said Jason Chism, president of Steelworkers Local 50, one of two Steelworkers locals at the plant. The average steelworker made \$64,000, says Chism.



Thanksgiving turkeys and canned goods were distributed to laid-off steelworkers in Granite City on Nov. 17. Photo by Brad Choate of KMOX (1120 AM)

The people of the Granite City area have stepped up to help, he said. They raised \$50,000 at a fundraiser sponsored by the Rotary Club at Gateway Motorsports track in early November. It will go to a hardship fund for steelworkers run by the United Way.

The TorHoerman law firm, Eudora Global, Gateway Family Church and other contributors set aside 500 turkeys and food baskets for steelworkers, out of the 1,500 they distributed to needy families in Granite City and Alton.

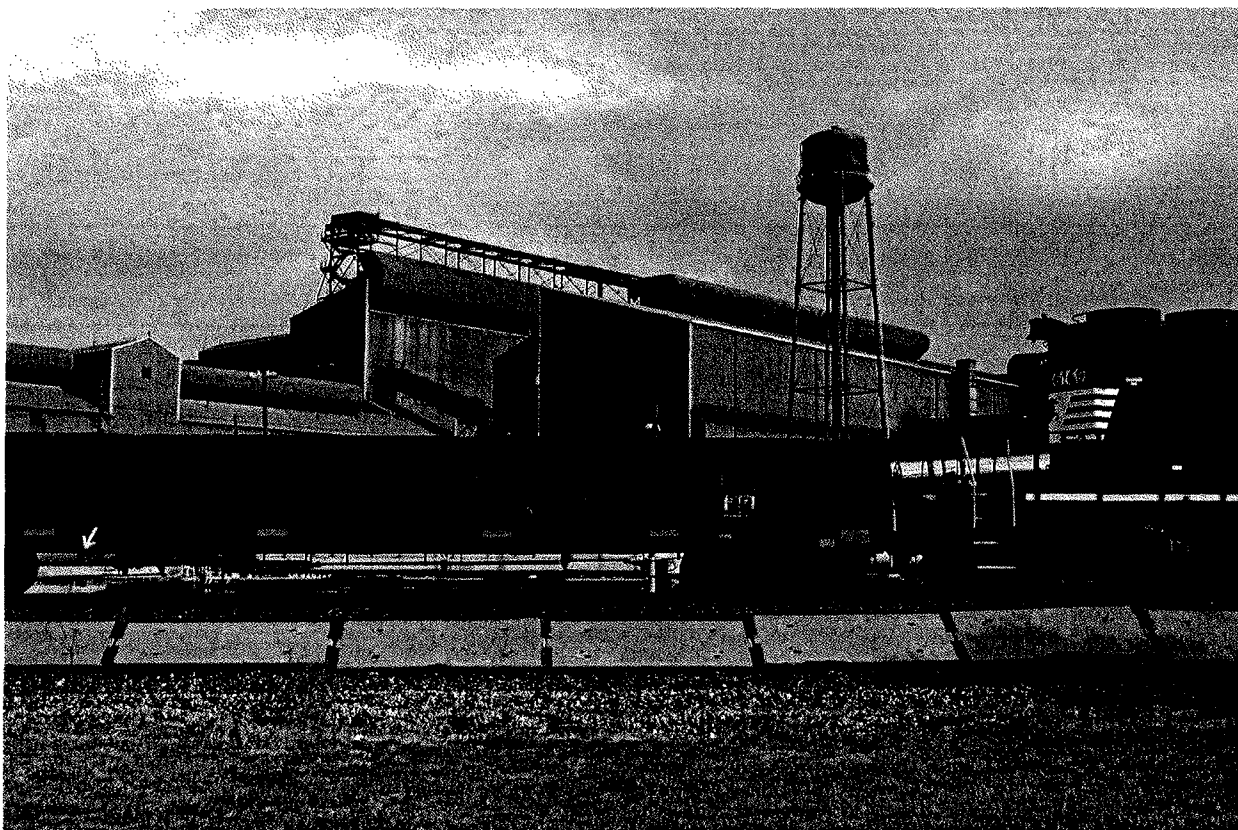
About 100 steelworkers came during a special food distribution at the Granite City Community Care Center in September. "I do know a few that lost their homes," said Debra Homyer, manager of the Community Care Center. "More and more we're hearing that they had to sell their homes."

Steelworkers qualify for free job training under the federal Trade Adjustment Assistance program, and taking training can extend unemployment payments. Some are learning to be truck drivers and heating system specialists, said Dan Simmons, president of Local 1899 of the USW.

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“They have not found good, substantial work,” he said.



A view of United States Steel Corp. from 14th Street on Wednesday, March 25, 2015 in Granite City. The company announced it would temporarily idle its operations in Granite City and lay off more than 2,000 local workers. Photo by Huy Mach, [hmach@post-dispatch.com](mailto:hmach@post-dispatch.com)

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Huy Mach

Most of Granite City's steel went for making tubes, mainly for the oil and gas industry. That industry has been on its back since oil prices plunged two years ago, turning the fracking boom to bust.

U.S. Steel's Lone Star tube plant remains shut, and that's where much of Granite City's steel was shipped. The company's tube plants in Birmingham, Ala., and Lorain, Ohio, slog on at low levels.

When announcing the layoffs last year, U.S. Steel complained of a flood of low-price steel imports from Asia. The Commerce Department in May ruled that China, other Asian nations and Italy were dumping steel at unfair prices, and imposed countervailing charges.

That slowed the import flow, and union leaders say it led U.S. Steel to keep the steel finishing operation working in Granite City. But pipe-makers are still working through a nine-month supply of imported steel. Union leaders hope that the rest of the mill may reopen once the surplus is used up.

"The trade case worked," said Chism. "I'm optimistic it will be better in 2017."

Steel prices have been trending up recently, and U.S. Steel turned a \$51 million profit in the September quarter, up from a \$46 million loss a year earlier.

But analysts don't see a major revival ahead in the face of a worldwide glut of steelmaking capacity. "We expect selling prices to remain under pressure from weak energy market demand, and low utilization rates should continue to lead to low shipments and high unit costs," said analysts at J.P. Morgan in a report this month.

## Factory town

Granite City, population 29,000, is the ultimate factory town. American Steel makes parts for railcars in Granite City. Kraft and Prairie Farms make food. The Mississippi River port draws other employers.

"There is a huge tax base, a huge employment base here," said Mayor Ed Hagnauer.

Between the plants are older blue-collar neighborhoods where household income of \$44,000 per year is about 80 percent of the average for metro St. Louis.

It's hard to judge the impact of layoffs on the city, says Hagnauer. The city will get a hint at year-end, when tax revenue rolls in.

About a third of mill workers live in the 62040 ZIP code, which includes mainly Granite City and Pontoon Beach.

In downtown Granite City, next to the mill, retailers say they've lost some business since the mill closed, although the loss isn't critical.

Jim's Pawn and Jewelry is a local mecca for Hollywood and 1960s nostalgia a couple of blocks from the mill. There is a collection of velvet paintings and posters of Marilyn Monroe, Audrey Hepburn and Elvis among the standard fare of pawned jewelry and power tools for sale.

Just after the layoffs, the store saw a spurt of steelworkers coming in to pawn items, but that ceased fairly quickly. The major effect has been a drop in sales of big-ticket items, said clerk Logan Schellhardt. "We're still seeing a lot of the guys, but they're not buying the big stuff. We feel for them," he said.

Steelworkers would drop in at Stephanie's Spiritual Therapy for foot detox, meditations, vibration oil massages or the oils and candles on the shelves.

The mill closing hasn't caused a major drop in business, said Miranda Pryor, who was minding the store on a weekday afternoon. "We liked seeing them in here. They were our regulars," she said.

Retailers tell the mayor that their sales have declined less than 20 percent. That may be because laid-off workers shop close to home, rather than heading off to big malls elsewhere in the metro area. In 2009, the last time the mill closed, Granite City had one of its best years for sales tax collections, said the mayor. "People stayed at home," he said.

Ruth Petri, 91, was working the grill on a recent afternoon at Petri Cafe, two blocks from the mill. Son Larry Petri was on the register.





Larry Petri, (left), longtime proprietor of Petri Cafe in Granite City, chats with customers Natalie and Ryan Roy of Hartford, Ill. on Wednesday, Nov. 23, 2016, as they have a late breakfast together there. Petri has fed thousands of meals to US Steel workers because the cafe sits between the US Steel administration building and the steel mill itself. He doesn't see many steel workers nowadays due to most of the plant shuttering more than a year ago. According to his wife, "he's been here 60 of the 70 years" Petri's has been open. Photo by Christian Gooden, [cgooden@post-dispatch.com](mailto:cgooden@post-dispatch.com)

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Photos by Christian Gooden • [cgooden@post-dispatch.com](mailto:cgooden@post-dispatch.com)

The cafe has survived the ups and downs of the steel industry for 70 years. It has a crowd of loyal customers, many of them older, says Larry Petri.

But he misses the steelworkers, and the plant contractors who would come for lunch.

"I'm not saying it doesn't hurt us. It does," said Larry Petri, after bidding goodbye to a retired teacher who has been coming since the 1960s. But like Granite City, Petri's will go on.

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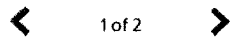
U.S. Steel CEO says company could restore up to 10,000 U.S. jobs

Jim Gallagher

METRO-EAST NEWS DECEMBER 19, 2016 3:01 PM

# Good news for Granite City steelworkers: Unemployment benefits extended

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U.S. Steel says a part of the Granite City, Illinois, steel mill will reopen in early 2017. **Steve Nagy** - [snagy@bnd.com](mailto:snagy@bnd.com)

BY JOSEPH BUSTOS  
[jbustos@bnd.com](mailto:jbustos@bnd.com)

GRANITE CITY — Gov. Bruce Rauner on Monday signed legislation that extends unemployment benefits for steelworkers who were laid off at Granite City Works to 52 weeks from 26 weeks.

About 2,000 people were laid off from the steel plant last winter when Granite City Works' blast furnaces, steel-making facilities and the hot strip mill were idled in response to challenging global market conditions.

Roughly 220 employees are being brought back in mid-February by U.S. Steel, which plans to begin processing slabs on the hot strip mill at Granite City Works as the steel corporation plans to make upgrades at other plants.



**THIS LEGISLATION WILL HELP THE HARD-WORKING FAMILIES OF THE METRO-EAST WHO LOST THEIR JOBS THROUGH NO FAULT OF THEIR OWN. WHILE WE ARE ENCOURAGED BY THE RECENT NEWS THAT MORE THAN 200 JOBS WILL RETURN TO THE GRANITE CITY**

**FACILITY, WE HOPE THAT BY EXTENDING UNEMPLOYMENT BENEFITS WE ARE ABLE TO HELP THE OTHER LAID-OFF WORKERS BRIDGE THE GAP UNTIL THEY ARE GAINFULLY EMPLOYED AGAIN.**

Gov. Bruce Rauner

“This legislation will help the hard-working families of the metro-east who lost their jobs through no fault of their own,” Rauner said in a statement. “While we are encouraged by the recent news that more than 200 jobs will return to the Granite City facility, we hope that by extending unemployment benefits we are able to help the other laid off workers bridge the gap until they are gainfully employed again.”

State Rep. Jay Hoffman, D-Belleville, was one of the original sponsors of the legislation, along with State Rep. Dan Beiser, D-Alton and State Sen. Bill Haine, D-Alton.

“Through no fault of their own, the employees and families of the U.S. Steel plant in Granite City have been laid off, forced to make tremendous sacrifices and suffered greatly over the past year due to the illegal dumping of foreign steel into U.S. markets,” Hoffman said. “(The governor’s) action will certainly help these families during a very difficult time.”

Benefits will be paid out from the Unemployment Insurance Trust Fund, which is a special fund derived from a state unemployment tax paid by Illinois employers, not the state’s general revenue fund.

“This will help hundreds of steelworkers make ends meet while trying to remain hopeful U.S. Steel will restart its Granite City facility in 2017,” said Local 50 President Jason Chism.

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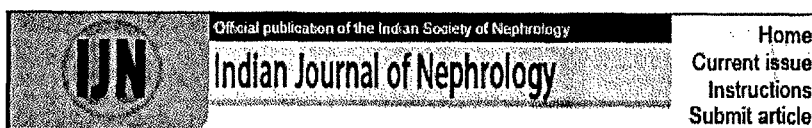
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Indian J Nephrol. 2015 Mar-Apr; 25(2): 65–69.  
doi: [10.4103/0971-4065.150078](https://doi.org/10.4103/0971-4065.150078)

PMCID: PMC4379627

## Chronic kidney disease in disadvantaged populations

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*“Of all of the forms of inequality, injustice in health is the most shocking and inhumane.”*

*Dr. Martin Luther King Jr.*

March 12, 2015 will mark the 10<sup>th</sup> anniversary of World Kidney Day (WKD), an initiative of the International Society of Nephrology and the International Federation of Kidney Foundations. Since its inception in 2006, WKD has become the most successful effort ever mounted to raise awareness among decision-makers and the general public about the importance of kidney disease. Each year WKD reminds us that kidney disease is common, harmful and treatable. The focus of WKD 2015 is on chronic kidney disease (CKD) in disadvantaged populations. This article reviews the key links between poverty and CKD and the consequent implications for the prevention of kidney disease and the care of kidney patients in these populations.

Chronic kidney disease is increasingly recognized as a global public health problem and a key determinant of the poor health outcomes. There is compelling evidence that disadvantaged communities, that is, those from low resource, racial and minority ethnic communities, and/or indigenous and socially disadvantaged backgrounds, suffer from marked increases in the burden of unrecognized and untreated CKD. Although the entire population of some low and middle-income countries could be considered disadvantaged, further discrimination on the basis of local factors creates a position of extreme disadvantage for certain population groups (peasants, those living in some rural areas, women, the elderly, religious minorities, etc). The fact that even in developed countries, racial and ethnic minorities bear a disproportionate burden of CKD and have worse outcomes, suggests there is much to learn beyond the traditional risk factors contributing to CKD-associated complications.[1]

About 1.2 billion people live in extreme poverty worldwide. Poverty negatively influences healthy behaviors, health care access and environmental exposure, all of which contribute to health care disparities [2] [Table 1]. The poor are more susceptible to disease because of lack of access to goods and services, in particular clean water and sanitation, information about preventive behaviors, adequate nutrition, and reduced access to health care.[3]

### **Chronic Kidney Disease in Developed Countries**

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In the US, ethnic minorities have a higher incidence of end stage renal disease (ESRD). Despite similar prevalence rates for early stages of CKD, [4] poor outcomes such as ESRD are 1.5–4 times higher [2,5,6,7] among minorities (i.e. African-American, Hispanic and Native Americans). Poverty further increases the disparity in ESRD rates, with African-Americans being at greater risk. [8] In the UK, rates of treated ESRD are higher in ethnic minority groups and with increasing social deprivation. [9] Similarly in Singapore, CKD prevalence is higher among Malays and Indians compared to the Chinese, with socioeconomic and behavioral factors accounting for 70–80% of the excess risk. [10]

End stage renal disease incidence is also higher among the less advantaged indigenous populations in developed countries. Canadian First Nations people experience ESRD at rates 2.5–4 times higher than the general population. [11] In Australia, the increase in the number of indigenous people starting renal replacement therapy (RRT) over the past 25 years exceeded that of the nonindigenous population by 3.5-fold, largely due to a disproportionate (>10-fold) difference in ESRD due to type II diabetic nephropathy, a disease largely attributable to lifestyle issues such as poor nutrition and lack of exercise. [12] Indigenous populations also have a higher incidence of ESRD due to glomerulonephritis and hypertension. [13] Compared to the US general population, the ESRD incidence rate is higher in Guam and Hawaii, where the proportion of indigenous people is high, again driven primarily by diabetic ESRD. [14] Native Americans have a greater prevalence of albuminuria and higher ESRD incidence rate. [15,16,17,18] Nearly three-quarters of all incident ESRD cases among this population have been attributable to type II diabetes.

### **Chronic Kidney Disease in Developing Countries**

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Poverty-related factors such as infectious diseases secondary to poor sanitation, inadequate supply of safe water, environmental pollutants and high concentrations of disease-transmitting vectors continue to play an important role in the development of CKD in low-income countries. Although rates of diabetic nephropathy are rising, chronic glomerulonephritis and interstitial nephritis are among the principal causes of CKD in many countries. Of note is the emergence of HIV-associated nephropathy as the major cause of CKD in sub-Saharan Africa. [19]

A high prevalence of CKD of unknown etiology has been reported in rural agricultural communities from Central America, Egypt, India and Sri Lanka. Male farm workers are affected disproportionately, and the clinical presentation is suggestive of interstitial nephritis, confirmed on renal biopsies. The strong association with farm work has led to suggestions that exposure to agrochemicals, dehydration, and consumption of contaminated water might be responsible. [20] Additionally, the use of traditional herbal medications is common and frequently associated with CKD among the poor. [21,22] In Mexico, CKD prevalence among the poor is 2–3-fold higher than the general population, and the etiology is unknown in 30% of ESRD patients. [23,24,25,26]

### **Low-Birth Weight and Risk of Chronic Kidney Disease in the Disadvantaged Populations**

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An association between low birth weight (LBW) due primarily to nutritional factors and kidney disease has been described in disadvantaged populations. The frequency of LBW is more than double in the aboriginal population than in the non-Aboriginal population of Australia. The high prevalence of albuminuria in this population has been linked to low nephron number related to LBW. [27,28] Morphometric studies of kidney biopsies in the Aborigines show glomerulomegaly, perhaps secondary to nephron deficiency, which might predispose to glomerulosclerosis. [29,30] A correlation between LBW and CKD has also been described in poor African-Americans and Caucasians living in the Southeastern US. [31] Similarly, in an Indian cohort, LBW and early malnutrition were associated with later development of metabolic syndrome, diabetes and

diabetic nephropathy.[32] The finding of a high prevalence of proteinuria, elevated blood pressure and CKD of unknown etiology in South Asian children may also be explained by this mechanism.[33,34]

### **Disparities in Access to Renal Replacement Therapy**

A recent analysis shows that globally, there were 2.6 million people on dialysis in 2010, 93% in high or upper middle-income countries. By contrast, the number of people requiring RRT was estimated at 4.9-9 million, suggesting that at least 2.3 million died prematurely because of lack of access to RRT. Even though diabetes and hypertension increase the burden of CKD, the current provision of RRT is linked largely to two factors - per capita GNP and age, suggesting that poverty is a major disadvantage for receiving RRT. By 2030, the number of people receiving RRT around the world is projected to increase to 5.4 million. Most of this increase will be in developing countries of Asia and Africa.[35]

Access to RRT in the emerging world is dependent mostly on the health care expenditures and economic strength of individual countries, with the relationship between income and access to RRT being almost linear in low and middle-income countries.[19,36] In Latin America, RRT prevalence and kidney transplantation rates correlate significantly with gross national income and health expenditure,[37] while in India and Pakistan <10% of all ESRD patients have access to RRT.[38] Additionally, developing countries have low transplant rates because of a combination of low levels of infrastructure; geographical remoteness; lack of legislation governing brain death; religious, cultural and social constraints; and commercial incentives that favor dialysis.[39]

There are also differences in utilization of renal replacement modalities between indigenous and nonindigenous groups in the developed countries. In Australia and New Zealand, the proportion of people receiving home dialysis is considerably lower among indigenous people. At the end of 2007 in Australia, 33% of nonindigenous people requiring RRT were receiving home-based dialysis therapies, in contrast to 18% of Aboriginal people. In New Zealand, home-based dialysis was utilized by 62% of nonindigenous RRT population but only by 42% of Maori/Pacific Islanders.[12] The rate of kidney transplantation is also lower among disadvantaged communities. Maori and Pacific people are only 25% as likely to get a transplant as European New Zealanders, and the proportion of indigenous people who underwent transplantation and had a functioning kidney transplant is lower among Aboriginal Australians (12%) compared to nonindigenous Australians (45%). In the UK, white individuals from socially deprived areas, South Asians and blacks were all less likely to receive a preemptive renal transplant or living donor transplants than their more affluent white counterparts.[9] A multinational study found that when compared with white patients, the likelihood of receiving a transplant for Aboriginal patients was 77% lower in Australia and New Zealand, and 66% lower in Canadian First Nations individuals.[40]

Disparities in renal care are more evident in developing nations. Data from India shows that there are fewer nephrologists and nephrology services in the poorer states. As a result, people living in these states are likely to receive less care.[41] In Mexico, the fragmentation of the health care system has resulted in unequal access to RRT. In the state of Jalisco, the acceptance and prevalence rates in the more economically advantaged insured population were higher (327 pmp and 939 pmp, respectively) than for patients without medical insurance (99 pmp and 166 pmp, respectively) The transplant rate also was dramatically different, at 72 pmp for those with health insurance and 7.5 pmp for those without it.[42]

### **The Bidirectional Relationship Between Poverty and Chronic Kidney Disease**

~~In addition to having a higher disease burden, the poor have limited access to resources for meeting the treatment costs. A large proportion of patients who are forced to meet the expensive ESRD treatment costs by incurring out-of-pocket expenditure get pushed into extreme poverty. In one Indian study, over 70% patients undergoing kidney transplantation experienced catastrophic health care expenditures.[43] Entire families felt the impact of this, including job losses and interruptions in education of children,~~

## Outcomes

Overall mortality rates among those who do receive RRT are higher in the indigenous, minorities, and the uninsured populations, even after adjustment for co-morbidities. The hazard ratios for death on dialysis relative to the nonindigenous group are 1.4 for Aboriginal Australians and New Zealand Maori.[44] The Canadian First Nations patients achieve target levels for BP and mineral metabolism less frequently.[45] In the US, living in predominantly black neighborhoods was associated with higher than expected mortality rates on dialysis and increased time to transplantation.[46] Similarly, black patients on PD had a higher risk of death or technique failure compared to whites.[47]

In Mexico, the mortality on PD is 3-fold higher among the uninsured population compared to Mexican patients receiving treatment in the US, and the survival rate is significantly lower than the insured Mexican population,[48] while in India almost two-thirds of the patients are unable to continue dialysis beyond the first 3 months due to financial reasons.[49]

## Summary

The increased burden of CKD in disadvantaged populations is due to both global factors and population-specific issues. Low socioeconomic status and poor access to care contribute to health care disparities, and exacerbate the negative effects of genetic or biologic predisposition. Provision of appropriate renal care to these populations requires a two-pronged approach: Expanding the reach of dialysis through development of low-cost alternatives that can be practiced in remote locations, and implementation and evaluation of cost-effective prevention strategies. Kidney transplantation should be promoted by expanding deceased donor transplant programs and use of inexpensive, generic immunosuppressive drugs. The message of WKD 2015 is that a concerted attack against the diseases that lead to ESRD, by increasing community outreach, better education, improved economic opportunity, and access to preventive medicine for those at highest risk, could end the unacceptable relationship between CKD and disadvantage in these communities.

## References

1. Pugsley D, Norris KC, Garcia-Garcia G, Agodoa L. Global approaches for understanding the disproportionate burden of chronic kidney disease. *Ethn Dis.* 2009;19:S1–1. [PubMed: 19480353]
2. Crews DC, Charles RF, Evans MK, Zonderman AB, Powe NR. Poverty, race, and CKD in a racially and socioeconomically diverse urban population. *Am J Kidney Dis.* 2010;55:992–1000. [PMCID: PMC2876201] [PubMed: 20207457]
3. Sachs JD. Report of the Commission on Macroeconomics and Health. Geneva: WHO; 2001. *Macroeconomics and Health: Investing in Health for Economic Development.*
4. Kalantar-Zadeh K, Block G, Humphreys MH, Kopple JD. Reverse epidemiology of cardiovascular risk factors in maintenance dialysis patients. *Kidney Int.* 2003;63:793–808. [PubMed: 12631061]
5. Hsu CY, Lin F, Vittinghoff E, Shlipak MG. Racial differences in the progression from chronic renal insufficiency to end-stage renal disease in the United States. *J Am Soc Nephrol.* 2003;14:2902–7. [PubMed: 14569100]
6. Norris K, Nissenson AR. Race, gender, and socioeconomic disparities in CKD in the United States. *J Am Soc Nephrol.* 2008;19:1261–70. [PubMed: 18525000]
7. Bruce MA, Beech BM, Crook ED, Sims M, Wyatt SB, Flessner MF, et al. Association of socioeconomic status and CKD among African Americans: The Jackson Heart Study. *Am J Kidney Dis.* 2010;55:1001–8. [PMCID: PMC2876216] [PubMed: 20381223]



8. Volkova N, McClellan W, Klein M, Flanders D, Kleinbaum D, Soucie JM, et al. Neighborhood poverty and racial differences in ESRD incidence. *J Am Soc Nephrol.* 2008;19:356–64. [PMCID: PMC2396744] [PubMed: 18057219]
9. Caskey FJ. Renal replacement therapy: Can we separate the effects of social deprivation and ethnicity? *Kidney Int Suppl* (2011) 2013;3:246–49. [PMCID: PMC4089723] [PubMed: 25018991]
10. Sabanayagam C, Lim SC, Wong TY, Lee J, Shankar A, Tai ES. Ethnic disparities in prevalence and impact of risk factors of chronic kidney disease. *Nephrol Dial Transplant.* 2010;25:2564–70. [PubMed: 20185856]
11. Gao S, Manns BJ, Culleton BF, Tonelli M, Quan H, Crowshoe L, et al. Prevalence of chronic kidney disease and survival among aboriginal people. *J Am Soc Nephrol.* 2007;18:2953–9. [PubMed: 17942955]
12. McDonald S. Incidence and treatment of ESRD among indigenous peoples of Australasia. *Clin Nephrol.* 2010;74(Suppl 1):S28–31. [PubMed: 20979960]
13. Collins JF. Kidney disease in Maori and Pacific people in New Zealand. *Clin Nephrol.* 2010;74(Suppl 1):S61–5. [PubMed: 20979966]
14. Weil EJ, Nelson RG. Kidney disease among the indigenous peoples of Oceania. *Ethn Dis.* 2006;16 (Suppl 2):S24–30.
15. United States Renal Data System: USRDS 2006 Annual Data Report. National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health. 2013
16. Kasiske BL, Rith-Najarian S, Casper ML, Croft JB. American Indian heritage and risk factors for renal injury. *Kidney Int.* 1998;54:1305–10. [PubMed: 9767548]
17. Nelson RG, Morgenstern H, Bennett PH. An epidemic of proteinuria in Pima Indians with type 2 diabetes mellitus. *Kidney Int.* 1998;54:2081–8. [PubMed: 9853273]
18. Scavini M, Shah VO, Stidley CA, Tentori F, Paine SS, Harford AM, et al. Kidney disease among the Zuni Indians: The Zuni Kidney Project. *Kidney Int Suppl.* 2005;(Suppl 97):S126–31. [PubMed: 16014090]
19. Jha V, Garcia-Garcia G, Iseki K, Li Z, Naicker S, Plattner B, et al. Chronic kidney disease: Global dimension and perspectives. *Lancet.* 2013;382:260–72. [PubMed: 23727169]
20. Almaguer M, Herrera R, Orantes CM. Chronic kidney disease of unknown etiology in agricultural communities. *MEDICC Rev.* 2014;16:9–15. [PubMed: 24878644]
21. Ulasi II, Ijoma CK, Onodugo OD, Arodiwe EB, Arodiwe EB, Ifebunandu NA, et al. Towards prevention of chronic kidney disease in Nigeria; a community-based study in Southeast Nigeria. *Kidney Int Suppl.* 2013;3:195–201.
22. Otieno LS, McLigeyo SO, Luta M. Acute renal failure following the use of herbal medicines. *East Afr Med J.* 1991;6:993–8. [PubMed: 1800100]
23. Obrador GT, García-García G, Villa AR, Rubilar X, Olvera N, Ferreira E, et al. Prevalence of chronic kidney disease in the Kidney Early Evaluation Program (KEEP) México and comparison with KEEP US. *Kidney Int Suppl.* 2010;77:S2–8. [PubMed: 20186176]
24. Gutierrez-Padilla JA, Mendoza-García M, Plascencia-Perez S, Renoirte-Lopez K, Garcia-Garcia G, Lloyd A, et al. Screening for CKD and cardiovascular disease risk factors using mobile clinics in Jalisco, Mexico. *Am J Kidney Dis.* 2010;55:474–84. [PubMed: 19850389]

25. García-García G, Gutiérrez-Padilla AJ, Chávez-Itigüez J, Pérez-Gómez HR, Mendoza-García M, González-De la Peña Mdel M, et al. Identifying undetected cases of chronic kidney disease in Mexico. Targeting high-risk populations. *Arch Med Res.* 2013;44:623–7. [PubMed: 24211755]
26. Amato D, Alvarez-Aguilar C, Castañeda-Limones R, Rodríguez E, Avila-Diaz M, Arreola F, et al. Prevalence of chronic kidney disease in an urban Mexican population. *Kidney Int Suppl.* 2005;(Suppl 97):S11–7. [PubMed: 16014087]
27. Hoy W, McDonald SP. Albuminuria: Marker or target in indigenous populations. *Kidney Int Suppl.* 2004:S25–31. [PubMed: 15485412]
28. McDonald SP, Maguire GP, Hoy WE. Renal function and cardiovascular risk markers in a remote Australian Aboriginal community. *Nephrol Dial Transplant.* 2003;18:1555–61. [PubMed: 12897094]
29. Hoy WE, Samuel T, Mott SA, Kincaid-Smith PS, Fogo AB, Dowling JP, et al. Renal biopsy findings among Indigenous Australians: A nationwide review. *Kidney Int.* 2012;82:1321–31. [PubMed: 22932120]
30. Hoy WE, Hughson MD, Zimanyi M, Samuel T, Douglas-Denton R, Holden L, et al. Distribution of volumes of individual glomeruli in kidneys at autopsy: Association with age, nephron number, birth weight and body mass index. *Clin Nephrol.* 2010;74(Suppl 1):S105–12. [PubMed: 20979974]
31. Lackland DT, Bendall HE, Osmond C, Egan BM, Barker DJ. Low birth weights contribute to high rates of early-onset chronic renal failure in the Southeastern United States. *Arch Intern Med.* 2000;160:1472–6. [PubMed: 10826460]
32. Bhargava SK, Sachdev HS, Fall CH, Osmond C, Lakshmy R, Barker DJ, et al. Relation of serial changes in childhood body-mass index to impaired glucose tolerance in young adulthood. *N Engl J Med.* 2004;350:865–75. [PMCID: PMC3408694] [PubMed: 14985484]
33. Jafar TH, Chaturvedi N, Hatcher J, Khan I, Rabbani A, Khan AQ, et al. Proteinuria in South Asian children: Prevalence and determinants. *Pediatr Nephrol.* 2005;20:1458–65. [PubMed: 15947988]
34. Jafar TH, Islam M, Poulter N, Hatcher J, Schmid CH, Levey AS, et al. Children in South Asia have higher body mass-adjusted blood pressure levels than white children in the United States: A comparative study. *Circulation.* 2005;111:1291–7. [PubMed: 15769771]
35. Liyanage T, Ninomiya T, Jha V, Patrice HM, Okpechi I, Zhao M, et al. Worldwide access to treatment for end stage kidney disease: A systematic review. *Lancet.* 2015 in press.
36. Barsoum RS. Chronic kidney disease in the developing world. *N Engl J Med.* 2006;354:997–9. [PubMed: 16525136]
37. Cusumano AM, Garcia-Garcia G, Gonzalez-Bedat MC, Marinovich S, Lugon J, Poblete-Badal H, et al. Latin American Dialysis and Transplant Registry: 2008 prevalence and incidence of end-stage renal disease and correlation with socioeconomic indexes. *Kidney Int Suppl (2011) 2013;3:153–56.* [PMCID: PMC4089651] [PubMed: 25018980]
38. Jha V. Current status of end-stage renal disease care in India and Pakistan. *Kidney Int Suppl.* 2013;3:157–60.
39. Garcia GG, Harden P, Chapman J. World Kidney Day Steering Committee 2012. The global role of kidney transplantation. *Lancet.* 2012;379:e36–8. [PubMed: 22405254]
40. Yeates KE, Cass A, Sequist TD, McDonald SP, Jardine MJ, Trpeski L, et al. Indigenous people in Australia, Canada, New Zealand and the United States are less likely to receive renal transplantation. *Kidney Int.* 2009;76:659–64. [PubMed: 19553910]

41. Jha V. Current status of chronic kidney disease care in southeast Asia. *Semin Nephrol.* 2009;29:487–96. [PubMed: 19751894]
42. Garcia-Garcia G, Monteon-Ramos JF, Garcia-Bejarano H, Gomez-Navarro B, Reyes IH, Lomeli AM, et al. Renal replacement therapy among disadvantaged populations in Mexico: A report from the Jalisco Dialysis and Transplant Registry (REDTJAL) *Kidney Int Suppl.* 2005;(Suppl 97):S58–61. [PubMed: 16014102]
43. Ramachandran R, Jha V. Kidney transplantation is associated with catastrophic out of pocket expenditure in India. *PLoS One.* 2013;8:e67812. [PMCID: PMC3701634] [PubMed: 23861812]
44. McDonald SP, Russ GR. Burden of end-stage renal disease among indigenous peoples in Australia and New Zealand. *Kidney Int Suppl.* 2003;(Suppl 97):S123–7. [PubMed: 12864890]
45. Chou SH, Tonelli M, Bradley JS, Gourishankar S, Hemmelgarn BR. Alberta Kidney Disease Network. Quality of care among Aboriginal hemodialysis patients. *Clin J Am Soc Nephrol.* 2006;1:58–63. [PubMed: 17699191]
46. Rodriguez RA, Sen S, Mehta K, Moody-Ayers S, Bacchetti P, O'Hare AM. Geography matters: Relationships among urban residential segregation, dialysis facilities, and patient outcomes. *Ann Intern Med.* 2007;146:493–501. [PubMed: 17404351]
47. Mehrotra R, Story K, Guest S, Fedunyszyn M. Neighborhood location, rurality, geography, and outcomes of peritoneal dialysis patients in the United States. *Perit Dial Int.* 2012;32:322–31. [PMCID: PMC3525420] [PubMed: 22135315]
48. Garcia-Garcia G, Briseño-Rentería G, Luquín-Arellan VH, Gao Z, Gill J, Tonelli M. Survival among patients with kidney failure in Jalisco, Mexico. *J Am Soc Nephrol.* 2007;18:1922–7. [PubMed: 17494884]
49. Parameswaran S, Geda SB, Rathi M, Kohli HS, Gupta KL, Sakhuja V, et al. Referral pattern of patients with end-stage renal disease at a public sector hospital and its impact on outcome. *Natl Med J India.* 2011;24:208–13. [PubMed: 22208139]

## Figures and Tables

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**Table 1**

<b>Health behavior</b>	<b>Access to health care</b>	<b>Biological factors</b>	<b>Environmental factors</b>
Lack of information on preventive behaviors	Lack of access to health care	Low birth weight	Increased exposure to pollutants
Lack of knowledge on how best to respond to an episode of illness	Greater distance from health-care providers	Genetic predisposition	Increased exposure to communicable disease
Health beliefs and unhealthy behaviors	Lack of out-of-pocket resources	Cumulative biological risk profiles	Lack of clean water and sanitation
		Inadequate nutrition	

Possible mechanisms by which poverty increases the burden of disease

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# Chronic Kidney Disease

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Updated: Jul 24, 2016

Author: Pradeep Arora, MD; Chief Editor: Vecihi Batuman, MD, FASN [more...](#)

## OVERVIEW

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### Practice Essentials

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Chronic kidney disease (CKD)—or chronic renal failure (CRF), as it was historically termed—is a term that encompasses all degrees of decreased renal function, from damaged-at risk through mild, moderate, and severe chronic kidney failure. CKD is a worldwide public health problem. In the United States, there is a rising incidence and prevalence of kidney failure, with poor outcomes and high cost (see Epidemiology).

CKD is more prevalent in the elderly population. However, while younger patients with CKD typically experience progressive loss of kidney function, 30% of patients over 65 years of age with CKD have stable disease.<sup>[1]</sup>

CKD is associated with an increased risk of cardiovascular disease and chronic renal failure. Kidney disease is the ninth leading cause of death in the United States.

The Kidney Disease Outcomes Quality Initiative (KDOQI) of the National Kidney Foundation (NKF) established a definition and classification of CKD in 2002.<sup>[3]</sup> The KDOQI and the international guideline group Kidney Disease Improving Global Outcomes (KDIGO) have subsequently updated these guidelines.<sup>[4, 5]</sup> These guidelines have allowed better communication among physicians and have facilitated intervention at the different stages of the disease.

The guidelines define CKD as either kidney damage or a decreased glomerular filtration rate (GFR) of less than 60 mL/min/1.73 m<sup>2</sup> for at least 3 months. Whatever the underlying etiology, once the loss of nephrons and reduction of functional renal mass reaches a certain point, the remaining nephrons begin a process of irreversible sclerosis that leads to a progressive decline in the GFR.

Hyperparathyroidism is one of the pathologic manifestations of CKD. See the image below.



Calciophylaxis due to secondary hyperparathyroidism.

### Staging

The different stages of CKD form a continuum. The stages of CKD are classified as follows<sup>[6]</sup>:

- Stage 1: Kidney damage with normal or increased GFR (>90 mL/min/1.73 m<sup>2</sup>)
- Stage 2: Mild reduction in GFR (60-89 mL/min/1.73 m<sup>2</sup>)
- Stage 3a: Moderate reduction in GFR (45-59 mL/min/1.73 m<sup>2</sup>)
- Stage 3b: Moderate reduction in GFR (30-44 mL/min/1.73 m<sup>2</sup>)

The US incidence of end-stage renal disease (ESRD) rose steadily from 1980-2001, but the rate subsequently leveled off at approximately 350 per 1 million population.<sup>[17]</sup> However, the percentage of patients older than 65 years has been the most rapidly growing segment of the ESRD population, having increased from 5% to 37% of this group.<sup>[17]</sup>

The US Surgeon General's latest report on 10-year national objectives for improving the health of all Americans, Healthy People 2020, contains a chapter focused on CKD. For 2020, Healthy People lays out 14 objectives concerning reduction of the US incidence, morbidity, mortality, and health costs of CKD. Reducing renal failure will require additional public health efforts, including effective preventive strategies and early detection and treatment of CKD.

A systematic review and meta-analysis of observational studies estimating CKD prevalence in general populations worldwide found a consistent estimated global CKD prevalence of 11-13%. The majority of cases are stage 3.<sup>[20]</sup>

### **Race-related demographics**

Although CKD affects all races, the incidence rate of ESRD among blacks in the United States is nearly 4 times that for whites.<sup>[17]</sup> Choi et al found that rates of ESRD among black patients exceeded those among white patients at all levels of baseline estimated glomerular filtration rate (GFR).<sup>[21]</sup> Risk of ESRD among black patients was highest at an estimated GFR of 45-59 mL/min/1.73 m<sup>2</sup>, as was the risk of mortality.

Schold et al found that among black kidney transplant recipients, rates of graft loss and acute rejection were higher than in white recipients, especially among younger patients.<sup>[22]</sup> Hicks et al looked at the connection between black patients with the sickle cell trait and their increased risk for kidney disease; the study found that sickle cell trait was not associated with diabetic or nondiabetic ESRD in a large sample of black patients.<sup>[23]</sup>

Important differences also exist in the frequency of specific causes of CKD among different races. In the Chronic Kidney Disease in Children (CKiD) Study, for example, glomerular disease was much more common among nonwhite persons.<sup>[24]</sup> Overall, FSGS in particular is more common among Hispanic Americans and black persons, as is the risk of nephropathy with diabetes or with hypertension; in contrast, IgA nephropathy is rare in black individuals and more common among those with Asian ancestry.<sup>[25]</sup>

### **Sex-related demographics**

In NHANES, the distribution of estimated GFRs for the stages of CKD was similar in both sexes. In the United States Renal Data System (USRDS) 2011 Annual Data Report, however, the incident rate of ESRD cases at the initiation of hemodialysis in 2009 was higher for males, with 415.1 per million population compared with 256.6 for females.<sup>[26]</sup>

CKD in children is somewhat more common in boys, because posterior urethral valves, the most common birth defect leading to CKD, occur only in boys. Importantly, many individuals with congenital kidney disease such as dysplasia or hypoplasia do not clinically manifest CKD or ESRD until adulthood.

## **Prognosis**

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Patients with chronic kidney disease (CKD) generally experience progressive loss of kidney function and are at risk for end-stage renal disease (ESRD). The rate of progression depends on age, the underlying diagnosis, the success of implementation of secondary preventive measures, and the individual patient. Timely initiation of chronic renal replacement therapy is imperative to prevent the uremic complications of CKD that can lead to significant morbidity and death.

Tangri et al developed and validated a model in adult patients that uses routine laboratory results to predict progression from CKD (stages 3-5) to kidney failure.<sup>[27]</sup> They reported that lower estimated glomerular filtration rate (GFR), higher albuminuria, younger age, and male sex pointed to a faster progression of kidney failure. Also, a lower serum albumin, calcium, and bicarbonate level and a higher serum phosphate level were found to predict an elevated risk of kidney failure.<sup>[27]</sup>

### **Hospitalization**

Unadjusted rates of hospitalization in the CKD population, reflecting its total disease burden, are 3-5 times higher than those of patients without CKD.<sup>[28]</sup> After adjustment for gender, prior hospitalizations, and comorbidity, rates for

patients with CKD are 1.4 times higher. Rates of hospitalization for cardiovascular disease and bacterial infection are particularly elevated. <sup>[26]</sup>

## Dialysis

In the United States, hemodialysis and peritoneal dialysis patients average 2 hospital admissions per year; patients who have a renal transplant average 1 hospital admission per year. Additionally, patients with ESRD who undergo renal transplantation survive longer than those on long-term dialysis. <sup>[26]</sup>

Hemodialysis performed 6 times per week significantly increased the risk of vascular access complications compared with a conventional 3-day regimen in one study. <sup>[29, 30]</sup> Of 125 patients who received hemodialysis 6 days per week, 48 experienced the composite primary endpoint event of vascular repair, loss, or related hospitalization, compared with only 29 of the 120 patients undergoing conventional treatment. Results indicated that overall risk for a first access event was 76% higher with daily hemodialysis than with the conventional regimen. <sup>[29, 30]</sup>

## Mortality

The mortality rates associated with CKD are striking. After adjustment for age, gender, race, comorbidity, and prior hospitalizations, mortality in patients with CKD in 2009 was 56% greater than that in patients without CKD. <sup>[26]</sup> For patients with stages 4-5 CKD, the adjusted mortality rate is 76% greater.

Mortality rates are consistently higher for men than for women, and for black persons than for white individuals and patients of other races. For Medicare CKD patients aged 66 years and older, deaths per 1000 patient-years in 2009 were 75 for white patients and 83 for black patients. <sup>[26]</sup>

The highest mortality rate is within the first 6 months of initiating dialysis. Mortality then tends to improve over the next 6 months, before increasing gradually over the next 4 years. The 5-year survival rate for a patient undergoing long-term dialysis in the United States is approximately 35%, and approximately 25% in patients with diabetes.

A study by Sens found that the risk of mortality was elevated in patients with ESRD and congestive heart failure who received peritoneal dialysis compared with those who received hemodialysis. <sup>[31]</sup> Median survival time was 20.4 months in patients receiving peritoneal dialysis versus 36.7 months in the hemodialysis group.

At every age, patients with ESRD on dialysis have significantly increased mortality when compared with nondialysis patients and individuals without kidney disease. At age 60 years, a healthy person can expect to live for more than 20 years, whereas the life expectancy of a patient aged 60 years who is starting hemodialysis is closer to 4 years. Among patients aged 65 years or older who have ESRD, mortality rates are 6 times higher than in the general population. <sup>[26]</sup>

The most common cause of sudden death in patients with ESRD is hyperkalemia, which often follows missed dialysis or dietary indiscretion. The most common cause of death overall in the dialysis population is cardiovascular disease; cardiovascular mortality is 10-20 times higher in dialysis patients than in the general population. <sup>[32]</sup>

The morbidity and mortality of dialysis patients is much higher in the United States than in most other countries, which is probably a consequence of selection bias. Because of liberal criteria for receiving government-funded dialysis in the United States and the use of rationing (medical and economic) in most other countries, US patients receiving dialysis are on the average older and sicker than those in other countries.

In the National Health and Nutrition Examination Survey (NHANES) III prevalence study, hypoalbuminemia (a marker of protein-energy malnutrition and a powerful predictive marker of mortality in dialysis patients, as well as in the general population) was independently associated with low bicarbonate, as well as with the inflammatory marker C-reactive protein. A study by Raphael et al suggests that higher serum bicarbonate levels are associated with better survival and renal outcomes in African Americans. <sup>[33]</sup>

A study by Navaneethan et al found a connection between low levels of 25-hydroxyvitamin D (25[OH]D) and all-cause mortality in patients with nondialysis CKD. <sup>[34]</sup> Adjusted risk of mortality was 33% higher in patients whose 25(OH)D levels were below 15 ng/mL.

Morbidity and mortality among children with CKD and ESRD are much lower than among adults with these conditions, but they are strikingly higher than for healthy children. As with adults, the risk is highest among dialysis patients; consequently, transplantation is the preferred treatment for pediatric patients with ESRD.

## Sexual and reproductive issues

Puberty is often delayed among males and females with significant CKD. Female patients with advanced CKD commonly develop menstrual irregularities. Women with ESRD are typically amenorrheic and infertile. However, pregnancy can occur and can be associated with accelerated renal decline, including in women with a kidney transplant. In advanced CKD and ESRD, pregnancy is associated with markedly decreased fetal survival.

## Vitamin D

Many patients with CKD have low circulating levels of 25(OH)D. A study of 1099 patients (mostly men) with advanced CKD found that the lowest tertile of 1,25(OH)<sub>2</sub>D (< 15 pg/mL) was associated with death and initiation of long-term dialysis therapy compared with the highest tertile (>22 pg/mL).<sup>[35]</sup> A retrospective cohort study in 12,763 non-dialysis-dependent patients with CKD found that 25(OH)D levels below 15 ng/mL were associated independently with all-cause mortality.<sup>[36]</sup>

## Patient Education

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Patients with chronic kidney disease (CKD) should be educated about the following:

- Importance of avoiding factors leading to increased progression (see Etiology)
- Natural disease progression
- Prescribed medications (highlighting their potential benefits and adverse effects)
- Avoidance of nephrotoxins
- Diet (see Diet)
- Renal replacement modalities, including peritoneal dialysis, hemodialysis, and transplantation
- Timely placement of vascular access for hemodialysis

Women of childbearing age who have end-stage renal disease (ESRD) should be counseled that although their fertility is greatly reduced, pregnancy can occur and is associated with higher risk than in women who do not have renal disease. In addition, many medications used to treat CKD are potentially teratogenic; in particular, women taking angiotensin-converting enzyme (ACE) inhibitors and certain immunosuppressive treatments require clear counseling.

## Clinical Presentation

### References

1. O'Hare AM, Choi AI, Bertenthal D, Bacchetti P, Garg AX, Kaufman JS, et al. Age affects outcomes in chronic kidney disease. *J Am Soc Nephrol*. 2007 Oct. 18(10):2758-65. [Medline].
2. Lameire N, Van Biesen W. The initiation of renal-replacement therapy--just-in-time delivery. *N Engl J Med*. 2010 Aug 12. 363(7):678-80. [Medline].
3. [Guideline] Levey AS, Coresh J, Balk E, Kausz AT, Levin A, Steffes MW, et al. National Kidney Foundation practice guidelines for chronic kidney disease: evaluation, classification, and stratification. *Ann Intern Med*. 2003 Jul 15. 139(2):137-47. [Medline].
4. Waknine Y. Kidney Disease Classification to Include Albuminuria. Medscape Medical News. Available at <http://www.medscape.com/viewarticle/776940>. December 31, 2012; Accessed: July 24, 2016.
5. [Guideline] Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. KDIGO 2012 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. *Kidney Int Suppl*. 2013. 3:1-150. [Full Text].
6. Thakar CV, Christianson A, Himmelfarb J, Leonard AC. Acute kidney injury episodes and chronic kidney disease risk in diabetes mellitus. *Clin J Am Soc Nephrol*. 2011 Nov. 6(11):2567-72. [Medline].
7. Bash LD, Erlinger TP, Coresh J, Marsh-Manzi J, Folsom AR, Astor BC. Inflammation, hemostasis, and the risk of kidney function decline in the Atherosclerosis Risk in Communities (ARIC) Study. *Am J Kidney Dis*. 2009 Apr. 53(4):596-605. [Medline]. [Full Text].



8. Hallan SI, Matsushita K, Sang Y, Mahmoodi BK, Black C, Ishani A, et al. Age and association of kidney measures with mortality and end-stage renal disease. *JAMA*. 2012 Dec 12. 308(22):2349-60. [Medline]. [Full Text].
9. de Boer IH. Chronic kidney disease—a challenge for all ages. *JAMA*. 2012 Dec 12. 308(22):2401-2. [Medline]. [Full Text].
10. Friedman DJ, Kozlitina J, Genovese G, Jog P, Pollak MR. Population-Based Risk Assessment of APOL1 on Renal Disease. *J Am Soc Nephrol*. 2011 Nov. 22(11):2098-105. [Medline].
11. Isakova T, Xie H, Yang W, Xie D, Anderson AH, Scialla J, et al. Fibroblast growth factor 23 and risks of mortality and end-stage renal disease in patients with chronic kidney disease. *JAMA*. 2011 Jun 15. 305(23):2432-9. [Medline]. [Full Text].
12. Ellis JW, Chen MH, Foster MC, Liu CT, Larson MG, de Boer I, et al. Validated SNPs for eGFR and their associations with albuminuria. *Hum Mol Genet*. 2012 Jul 15. 21(14):3293-8. [Medline]. [Full Text].
13. Pattaro C, Köttgen A, Teumer A, et al. Genome-wide association and functional follow-up reveals new loci for kidney function. *PLoS Genet*. 2012. 8(3):e1002584. [Medline]. [Full Text].
14. Nordfors L, Luttrupp K, Carrero JJ, Witasz A, Stenvinkel P, Lindholm B, et al. Genetic studies in chronic kidney disease: basic concepts. *J Nephrol*. 2012 Mar-Apr. 25(2):141-9. [Medline].
15. Su SL, Lu KC, Lin YF, Hsu YJ, Lee PY, Yang HY, et al. Gene polymorphisms of angiotensin-converting enzyme and angiotensin II type 1 receptor among chronic kidney disease patients in a Chinese population. *J Renin Angiotensin Aldosterone Syst*. 2012 Mar. 13(1):148-54. [Medline].
16. Stauffer ME, Fan T. Prevalence of anemia in chronic kidney disease in the United States. *PLoS One*. 2014. 9(1):e84943. [Medline]. [Full Text].
17. United States Renal Data System. Chapter 1: CKD in the General Population. *2015 USRDS annual data report: Epidemiology of Kidney Disease in the United States*. Bethesda, MD: National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases; 2015. [Full Text].
18. Centers for Disease Control and Prevention. Deaths and Mortality. Available at <http://www.cdc.gov/nchs/fastats/deaths.htm>.
19. Centers for Disease Control and Prevention. Prevalence of chronic kidney disease and associated risk factors--United States, 1999-2004. *MMWR Morb Mortal Wkly Rep*. 2007 Mar 2. 56(8):161-5. [Medline]. [Full Text].
20. Hill NR, Fatoba ST, Oke JL, Hirst JA, O'Callaghan CA, Lasserson DS, et al. Global Prevalence of Chronic Kidney Disease - A Systematic Review and Meta-Analysis. *PLoS One*. 2016. 11(7):e0158765. [Medline]. [Full Text].
21. Choi AI, Rodriguez RA, Bacchetti P, Bertenthal D, Hernandez GT, O'Hare AM. White/black racial differences in risk of end-stage renal disease and death. *Am J Med*. 2009 Jul. 122(7):672-8. [Medline]. [Full Text].
22. Schold JD, Srinivas TR, Braun WE, et al. The relative risk of overall graft loss and acute rejection among African American renal transplant recipients is attenuated with advancing age. *Clin Transplant*. 2011 Sep. 25(5):721-30. [Medline].
23. Hicks PJ, Langefeld CD, Lu L, Bleyer AJ, Divers J, Nachman PH, et al. Sickle cell trait is not independently associated with susceptibility to end-stage renal disease in African Americans. *Kidney Int*. 2011 Dec. 80(12):1339-43. [Medline].
24. Wong CS, Pierce CB, Cole SR, Warady BA, Mak RH, Benador NM, et al. Association of proteinuria with race, cause of chronic kidney disease, and glomerular filtration rate in the chronic kidney disease in children study. *Clin J Am Soc Nephrol*. 2009 Apr. 4(4):812-9. [Medline]. [Full Text].
25. Norris KC, Agodoa LY. Unraveling the racial disparities associated with kidney disease. *Kidney Int*. 2005 Sep. 68(3):914-24. [Medline].
26. United States Renal Data System. 2011 Annual Data Report. Available at <http://www.usrds.org/adr.aspx>. Accessed: Sept 6, 2012.

27. Tangri N, Stevens LA, Griffith J, Tighiouart H, Djurdjev O, Naimark D, et al. A predictive model for progression of chronic kidney disease to kidney failure. *JAMA*. 2011 Apr 20. 305(15):1553-9. [Medline].
28. Wolfe RA, Ashby VB, Milford EL, Ojo AO, Ettenger RE, Agodoa LY, et al. Comparison of mortality in all patients on dialysis, patients on dialysis awaiting transplantation, and recipients of a first cadaveric transplant. *N Engl J Med*. 1999 Dec 2. 341(23):1725-30. [Medline].
29. Suri RS, Larive B, Sherer S, Eggers P, Gassman J, James SH, et al. Risk of vascular access complications with frequent hemodialysis. *J Am Soc Nephrol*. 2013 Feb. 24(3):498-505. [Medline]. [Full Text].
30. McNamara D. More frequent dialysis increases risk for complications. February 13, 2013. Medscape Medical News. Available at <http://www.medscape.com/viewarticle/779265>. Accessed: August 29, 2013.
31. Sens F, Schott-Pethelaz AM, Labeeuw M, Colin C, Villar E. Survival advantage of hemodialysis relative to peritoneal dialysis in patients with end-stage renal disease and congestive heart failure. *Kidney Int*. 2011 Nov. 80(9):970-7. [Medline].
32. Wald R, Yan AT, Perl J, et al. Regression of left ventricular mass following conversion from conventional hemodialysis to thrice weekly in-centre nocturnal hemodialysis. *BMC Nephrol*. 2012 Jan 19. 13(1):3. [Medline].
33. Raphael KL, Wei G, Baird BC, Greene T, Beddhu S. Higher serum bicarbonate levels within the normal range are associated with better survival and renal outcomes in African Americans. *Kidney Int*. 2011 Feb. 79(3):356-62. [Medline].
34. Navaneethan SD, Schold JD, Arrigain S, et al. Low 25-Hydroxyvitamin D Levels and Mortality in Non-Dialysis-Dependent CKD. *Am J Kidney Dis*. 2011 Oct. 58(4):536-43. [Medline]. [Full Text].
35. Kendrick J, Cheung AK, Kaufman JS, Greene T, Roberts WL, Smits G, et al. Associations of plasma 25-hydroxyvitamin D and 1,25-dihydroxyvitamin D concentrations with death and progression to maintenance dialysis in patients with advanced kidney disease. *Am J Kidney Dis*. 2012 Oct. 60(4):567-75. [Medline]. [Full Text].
36. Navaneethan SD, Schold JD, Arrigain S, Jolly SE, Jain A, Schreiber MJ Jr, et al. Low 25-hydroxyvitamin D levels and mortality in non-dialysis-dependent CKD. *Am J Kidney Dis*. 2011 Oct. 58(4):536-43. [Medline]. [Full Text].
37. Hedayati SS, Minhajuddin AT, Toto RD, Morris DW, Rush AJ. Validation of depression screening scales in patients with CKD. *Am J Kidney Dis*. 2009 Sep. 54(3):433-9. [Medline].
38. Inker LA, Schmid CH, Tighiouart H, Eckfeldt JH, Feldman HI, Greene T, et al. Estimating glomerular filtration rate from serum creatinine and cystatin C. *N Engl J Med*. 2012 Jul 5. 367(1):20-9. [Medline].
39. Laterza OF, Price CP, Scott MG. Cystatin C: an improved estimator of glomerular filtration rate?. *Clin Chem*. 2002 May. 48(5):699-707. [Medline].
40. Lemoine S, Panaye M, Pelletier C, Bon C, Juillard L, Dubourg L, et al. Cystatin C-Creatinine Based Glomerular Filtration Rate Equation in Obese Chronic Kidney Disease Patients: Impact of Deindexation and Gender. *Am J Nephrol*. 2016 Jul 12. 44 (1):63-70. [Medline].
41. [Guideline] Barclay L. ACP Guidelines: Do Not Screen Asymptomatic Adults for CKD. *Medscape Medical News*. Oct 21 2013. [Full Text].
42. [Guideline] Barclay L. CKD: ASN Recommends Screening, Rejects ACP Statement. *Medscape Medical News*. Oct 23 2013. [Full Text].
43. Qaseem A, Hopkins RH, Sweet DE, et al. Screening, monitoring, and treatment of stage 1 to 3 chronic kidney disease: a clinical practice guideline From the Clinical Guidelines Committee of the American College of Physicians. *Ann Intern Med*. 2013 Oct 22. [Medline].
44. Galbraith LE, Ronksley PE, Barnieh LJ, Kappel J, Manns BJ, Samuel SM, et al. The See Kidney Disease Targeted Screening Program for CKD. *Clin J Am Soc Nephrol*. 2016 Jun 6. 11 (6):964-72. [Medline].
45. [Guideline] National Kidney Foundation's Kidney Disease Outcomes Quality Initiative. Chronic Kidney Disease: Evaluation, Classification, and Stratification. Available at [http://www.kidney.org/professionals/KDOQI/guidelines\\_ckd/toc.htm](http://www.kidney.org/professionals/KDOQI/guidelines_ckd/toc.htm). Accessed: September 6, 2012.

46. Levey AS, Bosch JP, Lewis JB, Greene T, Rogers N, Roth D. A more accurate method to estimate glomerular filtration rate from serum creatinine: a new prediction equation. Modification of Diet in Renal Disease Study Group. *Ann Intern Med.* 1999 Mar 16. 130(6):461-70. [Medline].
47. Stevens LA, Schmid CH, Greene T, Zhang YL, Beck GJ, Froissart M, et al. Comparative performance of the CKD Epidemiology Collaboration (CKD-EPI) and the Modification of Diet in Renal Disease (MDRD) Study equations for estimating GFR levels above 60 mL/min/1.73 m<sup>2</sup>. *Am J Kidney Dis.* 2010 Sep. 56(3):486-95. [Medline]. [Full Text].
48. Silveiro SP, Araújo GN, Ferreira MN, Souza FD, Yamaguchi HM, Camargo EG. Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation pronouncedly underestimates glomerular filtration rate in type 2 diabetes. *Diabetes Care.* 2011 Nov. 34(11):2353-5. [Medline]. [Full Text].
49. Schwartz GJ, Muñoz A, Schneider MF, Mak RH, Kaskel F, Warady BA, et al. New equations to estimate GFR in children with CKD. *J Am Soc Nephrol.* 2009 Mar. 20(3):629-37. [Medline]. [Full Text].
50. Nesrallah GE, Mustafa RA, Clark WF, Bass A, Barnieh L, Hemmelgarn BR, et al. Canadian Society of Nephrology 2014 clinical practice guideline for timing the initiation of chronic dialysis. *CMAJ.* 2014 Feb 4. 186(2):112-7. [Medline]. [Full Text].
51. Harrison L. Canada Guidelines Call for Kidney Dialysis Delay. Medscape [serial online]. Available at <http://www.medscape.com/viewarticle/820114>. Accessed: February 10, 2014.
52. Hand L. Antihypertensives May Delay Kidney Disease Progression. *Medscape Medical News.* Dec 16 2013. [Full Text].
53. Hsu TW, Liu JS, Hung SC, et al. Renoprotective effect of renin-angiotensin-aldosterone system blockade in patients with predialysis advanced chronic kidney disease, hypertension, and anemia. *JAMA Intern Med.* 2013 Dec 16. [Medline].
54. Park M, Hsu CY. An ACE in the hole for patients with advanced chronic kidney disease?. *JAMA Intern Med.* 2013 Dec 16. [Medline].
55. Henderson D. Popular Drugs Do Little to Prevent ESRD in Older Patients. *Medscape Medical News.* Jan 13 2014. [Full Text].
56. O'Hare AM, Hotchkiss JR, Kurella Tamura M, et al. Interpreting Treatment Effects From Clinical Trials in the Context of Real-World Risk Information: End-Stage Renal Disease Prevention in Older Adults. *JAMA Intern Med.* 2014 Jan 13. [Medline].
57. Peralta CA, Norris KC, Li S, et al. Blood Pressure Components and End-stage Renal Disease in Persons With Chronic Kidney Disease: The Kidney Early Evaluation Program (KEEP). *Arch Intern Med.* 2012 Jan 9. 172(1):41-47. [Medline].
58. Hermida RC, Ayala DE, Mojón A, Fernández JR. Bedtime Dosing of Antihypertensive Medications Reduces Cardiovascular Risk in CKD. *J Am Soc Nephrol.* 2011 Dec. 22(12):2313-21. [Medline].
59. Levey AS, Adler S, Caggiula AW, et al. Effects of dietary protein restriction on the progression of moderate renal disease in the Modification of Diet in Renal Disease Study. *J Am Soc Nephrol.* 1996 Dec. 7(12):2616-26. [Medline].
60. Kasiske BL, Lakatua JD, Ma JZ, Louis TA. A meta-analysis of the effects of dietary protein restriction on the rate of decline in renal function. *Am J Kidney Dis.* 1998 Jun. 31(6):954-61. [Medline].
61. Fishbane S, Chittineni H, Packman M, Dutka P, Ali N, Durie N. Oral paricalcitol in the treatment of patients with CKD and proteinuria: a randomized trial. *Am J Kidney Dis.* 2009 Oct. 54(4):647-52. [Medline].
62. Douglas D. Vitamin D Curbs Albuminuria in Kidney Disease. Medscape Medical News. Available at <http://www.medscape.com/viewarticle/810806>. Accessed: September 16, 2013.
63. Molina P, Górriz JL, Molina MD, Peris A, Beltrán S, Kanter J, et al. The effect of cholecalciferol for lowering albuminuria in chronic kidney disease: a prospective controlled study. *Nephrol Dial Transplant.* 2013 Aug 24. [Medline].

64. Plantinga L, Grubbs V, Sarkar U, et al. Nonsteroidal Anti-Inflammatory Drug Use Among Persons With Chronic Kidney Disease in the United States. *Ann Fam Med*. 2011 September-October. 9(5):423-430. [Medline]. [Full Text].
65. Hallan SI, Orth SR. Smoking is a risk factor in the progression to kidney failure. *Kidney Int*. 2011 Sep. 80(5):516-23. [Medline].
66. Busko M. L-thyroxine dampens renal function decline in CKD with SCH. June 19, 2013. Medscape Medical News [serial online]. Available at <http://www.medscape.com/viewarticle/806543>. Accessed: June 25, 2013.
67. Shin DH, Lee MJ, Lee HS, Oh HJ, Ko KI, Kim CH, et al. Thyroid hormone replacement therapy attenuates the decline of renal function in chronic kidney disease patients with subclinical hypothyroidism. *Thyroid*. 2013 Jun. 23(6):654-61. [Medline]. [Full Text].
68. US Food and Drug Administration. Safety: Omontys (peginesatide) Injection by Affymax and Takeda: recall of all lots - serious hypersensitivity reactions. February 23, 2013. Available at <http://www.fda.gov/Safety/MedWatch/SafetyInformation/SafetyAlertsforHumanMedicalProducts/ucm340895.htm>.
69. Shurraw S, Hemmelgarn B, Lin M, Majumdar SR, Klarenbach S, Manns B, et al. Association Between Glycemic Control and Adverse Outcomes in People With Diabetes Mellitus and Chronic Kidney Disease: A Population-Based Cohort Study. *Arch Intern Med*. 2011 Nov 28. 171(21):1920-1927. [Medline].
70. [Guideline] Kidney Disease: Improving Global Outcomes (KDIGO) CKD-MBD Work Group. KDIGO clinical practice guideline for the diagnosis, evaluation, prevention, and treatment of Chronic Kidney Disease-Mineral and Bone Disorder (CKD-MBD). *Kidney Int Suppl*. 2009 Aug. S1-130. [Medline].
71. London G, Coyne D, Hruska K, Malluche HH, Martin KJ. The new kidney disease: improving global outcomes (KDIGO) guidelines - expert clinical focus on bone and vascular calcification. *Clin Nephrol*. 2010 Dec. 74(6):423-32. [Medline].
72. [Guideline] Dasgupta I, Shroff R, Bennett-Jones D, McVeigh G, NICE Hyperphosphataemia Guideline Development Group. Management of hyperphosphataemia in chronic kidney disease: summary of National Institute for Health and Clinical Excellence (NICE) guideline. *Nephron Clin Pract*. 2013. 124 (1-2):1-9. [Medline]. [Full Text].
73. Shaman AM, Kowalski SR. Hyperphosphatemia Management in Patients with Chronic Kidney Disease. *Saudi Pharm J*. 2016 Jul. 24 (4):494-505. [Medline]. [Full Text].
74. Rizk R. Cost-effectiveness of phosphate binders among patients with chronic kidney disease not yet on dialysis: a long way to go. *BMC Nephrol*. 2016 Jul 8. 17 (1):75. [Medline]. [Full Text].
75. Block GA, Wheeler DC, Persky MS, Kestenbaum B, Ketteler M, Spiegel DM, et al. Effects of phosphate binders in moderate CKD. *J Am Soc Nephrol*. 2012 Aug. 23(8):1407-15. [Medline]. [Full Text].
76. de Brito-Ashurst I, Varagunam M, Raftery MJ, Yaqoob MM. Bicarbonate supplementation slows progression of CKD and improves nutritional status. *J Am Soc Nephrol*. 2009 Sep. 20(9):2075-84. [Medline]. [Full Text].
77. Barclay L. CKD: KDIGO Guidelines Recommend Wider Use of Statins. Medscape Medical News. Available at <http://www.medscape.com/viewarticle/817504>. Accessed: December 16, 2013.
78. [Guideline] Tonelli M, Wanner C. Lipid Management in Chronic Kidney Disease: Synopsis of the Kidney Disease: Improving Global Outcomes 2013 Clinical Practice Guideline. *Ann Intern Med*. 2013 Dec 10. [Medline].
79. Piccoli GB, Capizzi I, Vgotti FN, Leone F, D'Alessandro C, Giuffrida D, et al. Low protein diets in patients with chronic kidney disease: a bridge between mainstream and complementary-alternative medicines?. *BMC Nephrol*. 2016 Jul 8. 17 (1):76. [Medline]. [Full Text].
80. Suckling RJ, He FJ, Macgregor GA. Altered dietary salt intake for preventing and treating diabetic kidney disease. *Cochrane Database Syst Rev*. 2010 Dec 8. CD006763. [Medline].
81. Slagman MC, Waanders F, Hemmelder MH, et al. Moderate dietary sodium restriction added to angiotensin converting enzyme inhibition compared with dual blockade in lowering proteinuria and blood pressure: randomised controlled trial. *BMJ*. 2011 Jul 26. 343:d4366. [Medline]. [Full Text].

82. Vegter S, Perna A, Postma MJ, et al. Sodium Intake, ACE Inhibition, and Progression to ESRD. *J Am Soc Nephrol*. 2012 Jan. 23(1):165-73. [Medline].
83. Goraya N, Simoni J, Jo C, Wesson DE. Dietary acid reduction with fruits and vegetables or bicarbonate attenuates kidney injury in patients with a moderately reduced glomerular filtration rate due to hypertensive nephropathy. *Kidney Int*. 2012 Jan. 81(1):86-93. [Medline].
84. Sakaguchi Y, Shoji T, Kawabata H, Niihata K, Suzuki A, Kaneko T, et al. High prevalence of obstructive sleep apnea and its association with renal function among nondialysis chronic kidney disease patients in Japan: a cross-sectional study. *Clin J Am Soc Nephrol*. 2011 May. 6(5):995-1000. [Medline]. [Full Text].

#### Media Gallery

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Disclosure: Nothing to disclose.

##### Acknowledgements

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George R Aronoff, MD is a member of the following medical societies: American Federation for Medical Research, American Society of Nephrology, Kentucky Medical Association, and National Kidney Foundation

Disclosure: Nothing to disclose.

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Disclosure: Nothing to disclose.

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Disclosure: Medscape Salary Employment

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Disclosure: Nothing to disclose.

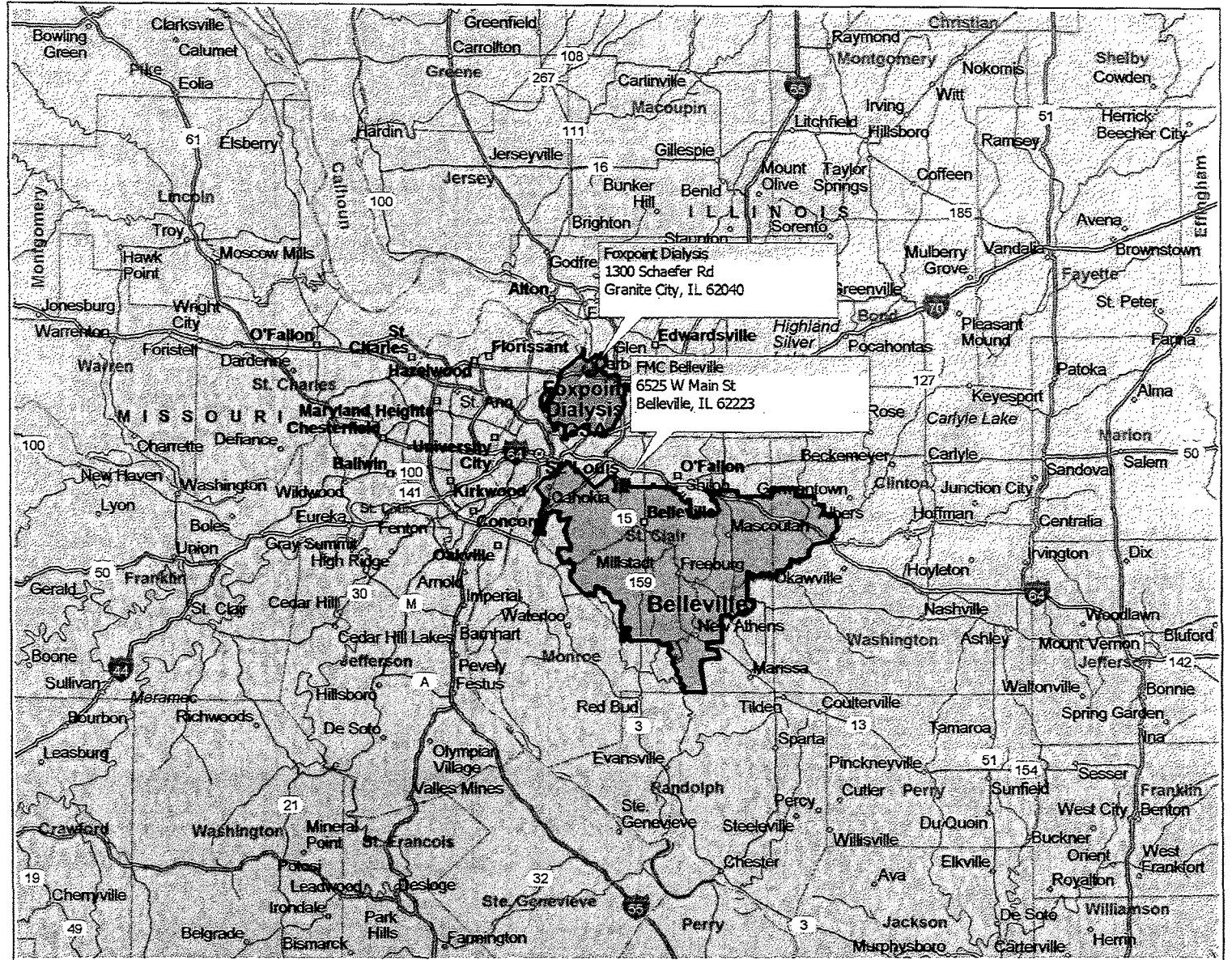
# Belleville GSA

## Custom territories

-  Belleville
-  Foxpoint Dialysis G...



## Pushpins

-  My pushpins




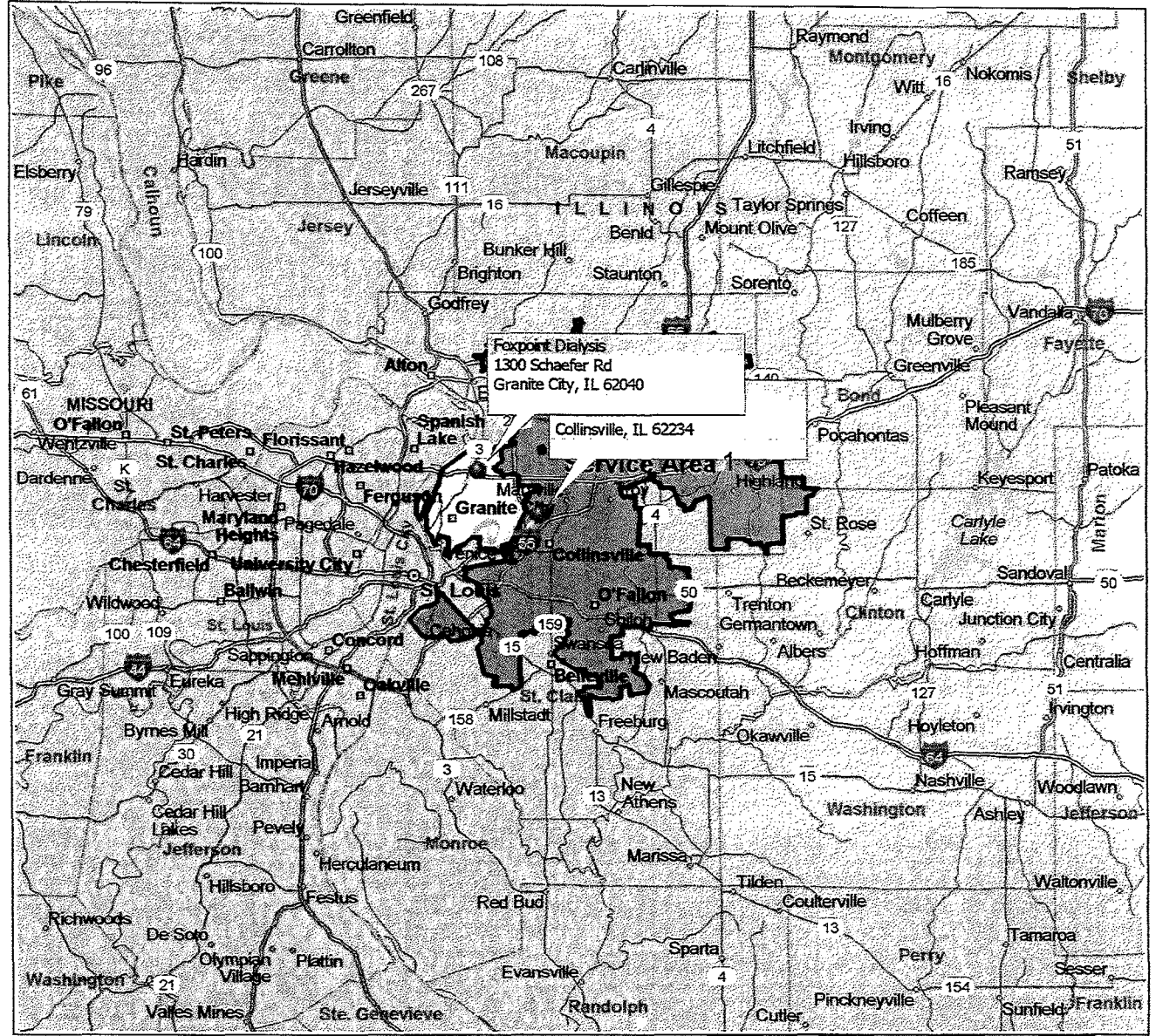
# Collinsville GSA

## Custom territories

-  Collinsville Service Area
-  Foxpoint Dialysis/Collinsville Service Ar...

## Pushpins

-  My pushpins



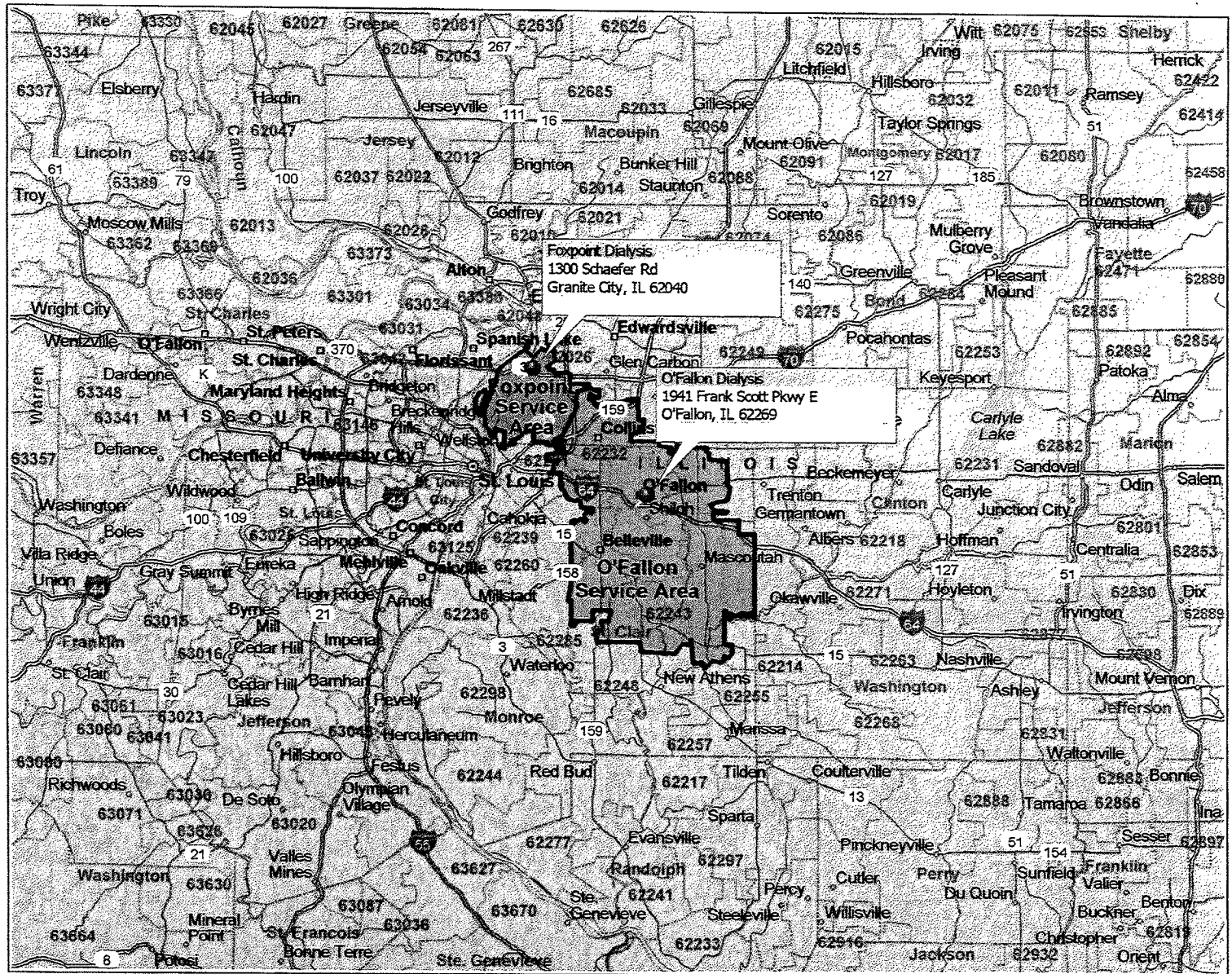
1 Primary Service Area

0 mi 10 20 30 40



# O'Fallon GSA

- O'Fallon Service Area
- Foxpoint Service Ar...
- O'Fallon Service Area
- Pushpins
- My pushpins

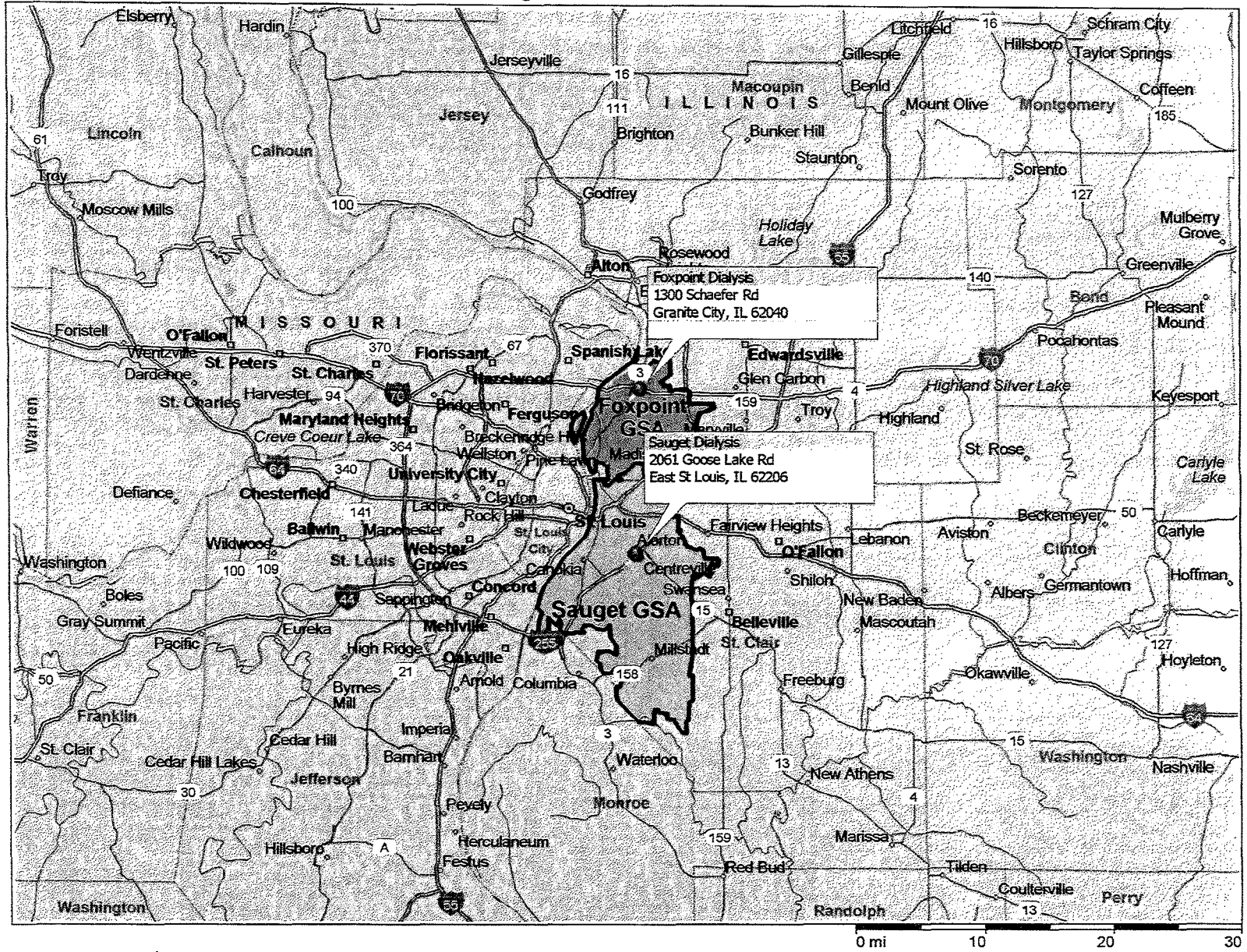


Attachment - 4

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# Sauget GSA

- Custom territories**
-  Foxpoint G...
  -  Sauget GSA
- Pushpins**
-  My pushpins



<b>ICHD ESRD Facility</b>	<b>Ownership</b>	<b>City</b>	<b>Granite City Approximate Midpoint</b>	<b>Round Trip Distance</b>	<b>Round Trip Drive Time</b>
Sauget Dialysis	DaVita	Sauget	3999 Nameoki Rd, Granite City, IL 62040	41.8	50
FMC Belleville Dialysis	Fresenius	Belleville	3999 Nameoki Rd, Granite City, IL 62040	39.3	54
O'Fallon Dialysis		O'Fallon	3999 Nameoki Rd, Granite City, IL 62040	47.5	56
Collinsville Dialyiss	DaVita	Collinsville	3999 Nameoki Rd, Granite City, IL 62040	15.8	26

<b>ICHD ESRD Facility</b>	<b>Monthly Cost (13 R/Ts) A1*</b>	<b>Monthly Cost (13 R/Ts) Best Med**</b>	<b>Monthly Cost (13 R/Ts) Client 1st***</b>	<b>Monthly Cost (13 R/Ts) EMT****</b>	<b>Monthly Cost (13 R/Ts) Helping Hands*****</b>
Sauget Dialysis	\$ 260.00	\$ 260.00	\$ 1,346.80	\$1,066.00 to \$1,690.00	\$896.61 to \$950.95
FMC Belleville Dialysis	\$ 260.00	\$ 260.00	\$ 1,281.80	\$1,066.00 to \$1,690.00	\$843.05 to \$894.14
O'Fallon Dialysis	\$ 325.00	\$ 260.00	\$ 1,495.00	\$1,066.00 to \$1,690.00	\$1,018.94 to \$1,080.69
Collinsville Dialyiss	\$ 260.00	\$ 260.00	\$ 670.80	\$416.00 to \$910.00	\$338.91 to \$359.45