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DIRECTORS & CO-INVESTIGATORS Allan Collins, MD, FACP, USRDS Director (entire ADR). Robert Foley, MB, MSC, USRDS Deputy Director (entire ADR). Blanche Chavers, MD (University of Minnesota School of Medicine; Vol 2, Ch 8). David Gilbertson, PhD (entire ADR). Charles Herzog, MD (Vol 1, Ch 5; Vol 2, Ch 9). Areef Ishani, MD, MS (Vol 1, Ch 8). Kirsten Johansen, MD (University of California at San Francisco; Vol 2, Ch 9). Bertram Kasiske, MD (Vol 2, Ch 7). Nancy Kutner, PhD (Emory University; Vol 2, Ch 9). Suying Li, PhD (Vol 1, Ch 4; Vol 2, Précis & Chs 1, 6, 8 & H & I tables). Jianzong Liu, PhD (maps; Vol 2, Ch 10; E tables). Lih-Wen Mau, PhD (Vol 1, Ch 9; Vol 2, Ch 12). Anne Murray, MD, MSC (Vol 1, Ch 6). Wendy St. Peter, PharmD, BCPS (Vol 1, Chs 3 & 7; Vol 2, HP2010 & Chs 1, 5, & 11). Jon Snyder, PhD (Vol 2, Ch 7). STAFF administrative staff Beth Forrest, BBA (Vol 2, Ch 12). ADR production Edward Constantini, MA (entire ADR). Susan Everson, PhD (entire ADR). biostatisticians Haifeng Guo, MS (Vol 1, Ch 3; Vol 2, HP2010 & Chs 5, 8, 10). Sally Gustafson, MS (Vol 2, Ch 7; E & F tables). Shuling Li, MS (Vol 1, Ch 6; Vol 2, HP2010 & Ch 9). Yi Peng, MS (Vol 1, Chs 1 & 2; Vol 2, Précis & Ch 6). Yang Qiu, MS (Vol 1, Ch 8). Ticia Roberts, MS (Vol 1, Ch 4; Vol 2, Précis & Chs 1, 6, 8, G tables). Melissa Skeans, MS (Vol 2, Précis, HP2010, Chs 3 & 7; E & F tables). Craig Solid, MS (entire ADR). Changchun Wang, MS (Vol 1, Précis & Chs 1, 2, 3, & 7; Vol 2, HP2010 & Ch 10). Eric Weinhandl, MS (Vol 1, Ch 5; Vol 2, Chs 5, 9, 10). David Zauf, MS (Vol 1, Ch 7; Vol 2, Chs 3, 5, 10). information systems & software development for all chapters, with additional work as noted: Cheryl Arko, BA. Shu-Cheng Chen, MS (Vol 2, Précis; Chs 4 & 8; D tables). Frederick Dalleska, MS (Vol 2, Précis, Ch 10; I tables). Frank Daniels, BS. James Ebben, BS (Vol 1, Ch 9; Vol 2, Précis & Ch 11; K tables). Eric Frazier, BS (Vol 2, Précis, HP2010, Chs 1, 2, 3, 4, 8, A, B, C, M tables). Christopher Hanzlik, BS. Roger Johnson, C. Daniel Sheets, BS. Xinyue Wang, BA/BS.

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The interpretation and reporting of these data are the responsibility of the author(s) and in no way should be seen as an official policy or interpretation of the U.S. government. FIGURE REFERENCES In titles, the superscript number or letter refers to the chapter, the following number or letter identifies the figure or table, and the italicized roman numeral identifies the volume. Citations should separate chapter, number, and volume by periods — i.e., 3.i.ii refers to Chapter Three, Figure 1, Volume Two.
Upon the mountain's edge with light touch resting,
There a brief while the globe of splendour sits
And seems a creature of the earth, but soon,
More changeful than the Moon,
To wane fantastic his great orb submits;
Or cone or mow of fire: till sinking slowly
Even to a star at length he lessons wholly.

Samuel Taylor Coleridge
“[A Sunset]”
PDF files of the 2010 ADR, booklet & Researcher’s Guide  +  PowerPoint slide files of all ADR figures & tables,  +  Excel files of the underlying data  +  Excel files of the complete reference tables  +  Render, our online query application for accessing USRDS data  +  An online application for requesting data from the USRDS  +  A navigable index of ADR figures & tables

new to this edition of the annual data report

An expanded volume on chronic kidney disease  +  A chapter on the transition to ESRD in nursing home patients, including information on cognitive function  +  Data on use & costs of the Medicare Part D prescription drug benefit for both CKD & ESRD patients  +  An Emerging Issues chapter on hospital admissions for infection  +  A Special Studies chapter with data on prescription drug therapy in patients with heart disease, the association of BMI & heart failure, bariatric surgery, patients receiving information on transplant options at the initiation of ESRD therapy, & the use of nutritional therapies  +  Comparative data on costs in the U.S. & Taiwan  +  New data on the incidence of ESRD in Asian & indigenous populations
**Volume One**

**PRÉCIS**

An introduction to chronic kidney disease in the United States + 17
- Summary statistics; awareness, treatment, & control; patient characteristics; prescription drug therapy; hospitalization & mortality; cardiovascular disease; the transition zone in nursing home patients; the transition to ESRD; acute kidney injury; costs of CKD

**ONE**

Chronic kidney disease in the general population + 30
- Strategies for identifying CKD; comorbidity burden; clinical & biochemical abnormalities; awareness, treatment, & control of disease conditions; predictive models for CKD; mortality

**TWO**

Chronic kidney disease identified in the claims data + 53
- Incidence & prevalence of recognized CKD; CKD as defined by the new diagnosis codes; comorbidity burden in patients with CKD; describing CKD through laboratory values

**THREE**

Care of patients with chronic kidney disease + 65
- Identified CKD & physician follow-up; laboratory evaluations; prescription drug therapy; biochemical levels & drug therapy

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**Volume Two**

**PRÉCIS**

An introduction to end-stage renal disease in the United States + 209
- Trends in patient counts & spending; modalities; quality of care; hospitalization & mortality; expenditures

**HEALTHY PEOPLE 2010** + 223
- Incidence rates; cardiovascular disease; counseling prior to ESRD; fistula use; transplantation; diabetes; care of patients with CKD & diabetes; urine microalbumin measurements; vaccinations; network achievement of HP2010 objectives

**ONE**

Emerging issues: hospital admissions for infection + 239
- All-cause & cause-specific hospital admissions; hospitalizations for vascular access infection; outpatient antibiotic use; infectious hospitalization & antibiotic use; mortality & antibiotic use

**TWO**

Incidence & prevalence + 253
- Incidence; prevalence; incident rates & racial differences; rare diseases; network populations

**THREE**

Patient characteristics + 267
- Patient care prior to initiation; anemia & treatment; laboratory values at initiation; transplant options; wait list & transplantation

**FOUR**

Treatment modalities + 277
- Incident modality; prevalent modality; home hemodialysis; introduction to Part D

**FIVE**

Clinical indicators & preventive health + 287
- Anemia treatment & hemoglobin control; preventive care; vascular access in prevalent patients; overview of Medicare Part D use
FOUR morbidity & mortality & 77
hospitalization rates in CKD & non-CKD patients; infectious hospitalizations; mortality rates

FIVE cardiovascular disease in patients with chronic kidney disease & 87
prescription drug therapy; survival & hospitalization; prevalent disease states; treatment for heart disease

SIX outcomes in the transition zone in nursing home patients with CKD & 99
cognitive function; physical function; mortality

SEVEN the transition to end-stage renal disease & 109
patient care & laboratory testing prior to ESRD; prescription drug therapy & medication continuity in the transition to ESRD

EIGHT acute kidney injury & 121
characteristics of patients with AKI; overall hazard & adjusted rates of AKI; patient care & outcomes following AKI hospitalization

NINE costs of chronic kidney disease & 133
overall costs; components of costs; Medicare Part D costs; CKD costs in the U.S. & Taiwan

REFERENCE TABLES: CKD & 145

SIX morbidity & mortality & 301
overall hospitalization; outcomes; hemodialysis matched to peritoneal dialysis; cause-specific hospitalization & mortality

SEVEN transplantation & 311
kidney transplant wait list; kidney donation & transplantation; transplant discharge & follow-up; transplant outcomes; transfusions & panel-reactive antibodies

EIGHT pediatric end-stage renal disease & 325
patient counts; preventive care & hospitalization; first-year hospitalization & mortality

NINE special studies & 335
cardiovascular special studies; rehabilitation & quality of life special studies; nutrition special studies

TEN providers & 353
provider growth; anemia treatment; clinical monitoring; preventive care; costs for interventions & preventive care; vascular access & fluid overload hospitalizations; standardized hospitalization & mortality ratios

ELEVEN costs of end-stage renal disease & 367
overall costs of ESRD; costs overall & for injectables & vascular access; racial differences in costs; costs in matched & unmatched dialysis populations; Medicare Part D costs

TWELVE international comparisons & 383
incidence & prevalence of ESRD; dialysis; transplantation; incident ESRD rates in Asian & indigenous populations

REFERENCE TABLES: ESRD & 397
This is the twenty second-annual report of the United States Renal Data System, and the eleventh in our Atlas series. For the third year we include a volume on chronic kidney disease (CKD), defining its burden in the general population, and looking at cardiovascular and other comorbidities, adverse events, preventive care, prescription medication therapy, care during the transition to ESRD, and costs to Medicare and employer group health plans. In Volume Two we provide information on the size and impact of the end-stage renal disease (ESRD) population — the traditional focus of the USRDS — presenting an overview of the ESRD program, along with detailed data on incidence, prevalence, comorbidity of new ESRD patients, severity in the filtering capacity of the kidney, defined by the estimated glomerular filtration rate (eGFR).

We approach Volume One from the perspective that the implications of CKD were under-appreciated prior to February, 2002, when a new CKD classification staging system was proposed. The five-stage system was developed using population-level data from the National Health and Nutrition Examination Survey (NHANES), a surveillance system coordinated by the National Center for Health Statistics at the Centers for Disease Control and Prevention. The conceptual model of this system was based on similar approaches for populations at risk for diabetes and hypertension, two well-known diseases that damage the kidney as well as other organ systems. The model characterizes the five-stage renal disease (ESRD) population — the traditional focus of the USRDS — presenting an overview of the ESRD program, along with detailed data on incidence, prevalence, incidence, prevalence, comorbidity of new ESRD patients, severity in the filtering capacity of the kidney, defined by the estimated glomerular filtration rate (eGFR).

There are many issues related to defining the levels of eGFR and urine albumin which indicate “true disease” in the kidney during the early stages of CKD, as compared to a normal reduction in kidney filtering capacity, particularly in the elderly. A new estimating equation was published in the Annals of Internal Medicine in May, 2009, improving on the MDRD method; we compare these two equations, providing a perspective for readers on the strengths and weaknesses of each. The USRDS and others will continue to investigate these issues in both the clinical and public health arenas, but already there is important data available on the impact of CKD, data based not only on biochemical information, but on the disease as defined within the Medicare and health plan datasets. The impact of the CKD staging system as a predictor of morbidity and mortality is now well known on a population level, but its translation into the care of individual patients is another matter.

The 2008 ADR was the first to include a volume dedicated to CKD; this year we expand the volume to ten chapters, including an analysis of acute kidney injury as well as a chapter on cardiovascular disease. New this year is a chapter on the transition between CKD and ESRD in nursing home patients, and analyses of medication use under the Part D prescription drug benefit, which began in 2006.
In the Précis we highlight some of the most important data from the chapters, and address the burden of CKD—an area of major public policy and health concern. In Chapter One we then define the CKD population, using NHANES cohorts over a 20-year period, and looking at the burden of chronic conditions such as diabetes and cardiovascular disease. We also compare CKD populations identified through the MDRD and CKD-EPI equations, and address the degree of biochemical and clinical abnormalities. We conclude with analyses of awareness, treatment, and control of cardiovascular risk factors, and an assessment of mortality rates by eGFR, race, and gender.

Basic descriptive and comorbidity information from the major datasets used by the USRDS—the 5 percent Medicare sample, and the MarketScan and Ingenix i3 databases—is summarized in Chapter Two. We use laboratory data from the Ingenix i3 LabRx dataset to define, by CKD stage, levels of typical biochemical parameters. Remarkably, the abnormalities identified here are quite similar to those in the NHANES population-level data. We also demonstrate the consistency of the relationship between CKD defined from actual laboratory data and that reported by diagnosis codes on claims for services.

In Chapter Three we address the care of patients with CKD, looking at the likelihood of urine microalbumin testing based on diabetic and hypertensive status. Testing rates are surprisingly low, particularly among patients with hypertension—known for its associated risk of kidney disease. We then report on the use of prescription medications, including ACEIs/ARBs, beta blockers, calcium channel blockers, lipid lowering agents, diuretics, ESAs, oral Vitamin D, and phosphate binders, and examine the degree of lipid and glycemic control.

Hospitalization and mortality across chronic disease conditions are examined in Chapter Four, along with hospitalizations for pneumonia, bacteremia/sepsis, and urinary tract infections, and trends in adjusted rates of mortality. Although increased recognition of kidney disease can bias the patient cohort over time, adjustments for severity of disease help reduce this bias, and demonstrate that survival has improved.

Cardiovascular disease in the CKD population is the focus of Chapter Five, in which we evaluate, by CKD stage, major cardiovascular diagnoses and interventions, medication use, survival, and hospitalization.

Chapter Six addresses the transition to ESRD in the institutionalized elderly entering nursing homes, using data from the Medicare Minimum Data Set. We first compare general nursing home patients to those with CKD and ESRD, then examine how memory, decision making, and the ability to make oneself understood change over time after admission to a nursing home. We also look at physical function in the non-CKD, CKD, and ESRD populations, and conclude with analyses of survival.

Chapter Seven addresses the transition from CKD to ESRD, a period of great concern, and one which may contribute to high mortality in the first months on dialysis. We illustrate the timeline for recognition of CKD prior to ESRD, and present data on visits to primary care physicians and to specialists among patients who reach ESRD, assessing when providers begin to recognize the trajectory of the disease in this vulnerable population.

In Chapter Eight we continue our analysis of acute kidney injury (AKI) and its relationship to CKD and ESRD. Recognized AKI has been increasing in both the Medicare and the younger EGHP populations. We examine the type of dialysis used, if any, and the underlying diagnoses. We then look at follow-up after discharge, determining which physicians see these patients and what role nephrologists play in the first year after AKI. We have also added data on medication use and on rehospitalization for AKI.

We conclude with Chapter Nine, addressing the costs associated with CKD, and introducing new analyses comparing costs in the U.S. and Taiwan. We also present data on prescription drug costs in 2007 under the new Part D benefit. Data presented in this volume illustrate the challenges that CKD, its complications, and its costs pose to the healthcare system and to policy makers. Programs to detect CKD have been initiated by the CDC, and the National Kidney Foundation’s Kidney Early Evaluation Program (KEEP) has been ongoing since 2000. By their nature, detection programs are broad-based approaches to define, through the use of simple tests, populations at risk of a disease or its complications, targeting...
Structure of the USRDS database

USRDS database (2.1 million patients)

Common Standard Re-usable Working Set Library

USRDS Annual Data Report
USRDS researcher SAF CDs
USRDS data analyses
USRDS custom data files
USRDS web-based applications

USRDS members

National Institute of Diabetes & Digestive & Kidney Diseases (NIDDK)
Robert Star, MD
Director, Division of Kidney, Urologic, & Hematologic Diseases (DKUHD)

Lawrence Y.C. Agodoa, MD
Co-Project Officer, USRDS; Director, End-Stage Renal Disease Program

Paul W. Eggers, PhD
Co-Project Officer, USRDS; Program Director, Kidney & Urology Epidemiology

April Merriwether
Contract Specialist, NIH/NIDDK

Centers for Medicare & Medicaid Services (CMS)
Diane L. Frankenfield, DrPH
Senior Research Analyst, Division of Research on Health Plans & Drugs (DRHPD), Research & Evaluation Group, Office of Research, Development, & Information (ORDI)

Mary Teresa Casey, RD, LD
Manager, ESRD Network Program, & Director, Division of Quality Improvement Policy for Chronic and Ambulatory Care (QIPAC), Quality Improvement Group, Office of Clinical Standards and Quality (OCSI)

Barry Straube, MD
CMS Chief Medical Officer & Director, OCSI

Debbie Hattery
Director, Information System Group, OCSI

USRDS Coordinating Center (CC) & Special Studies Centers (SSCs)
Allan J. Collins, MD, FACP
CC Director; Professor of Medicine, University of Minnesota (U of MN) School of Medicine; Nephrologist, Department of Medicine, Hennepin County Medical Center (HCMC)

Robert Foley, MB, MSc
CC Deputy Director; Associate Professor of Medicine, U of MN School of Medicine

Charles Herzog, MD
Director, Cardiovascular SSC; Staff Cardiologist, Department of Medicine, HCMC; Professor of Medicine, U of MN School of Medicine

Kirsten Johansen, MD
Director, Nutrition Special Studies Center; Associate Professor in Residence, Nephrology, University of California at San Francisco

Nancy Kutner, PhD
Director, Rehabilitation & Quality of Life Special Studies Center; Professor of Rehabilitation Medicine, Emory University Medical School

USRDS CC Co-Investigators
Blanche Chavers, MD
Professor of Pediatrics, U of MN School of Medicine

David Gilbertson, PhD
Director, Epidemiology & Biostatistics, USRDS

Charles Herzog, MD
Staff Cardiologist, Department of Medicine, HCMC; Professor of Medicine, U of MN School of Medicine

Areef Ishani, MD, MS
Clinical Scholar, Center for Epidemiology & Clinical Research; Assistant Professor of Medicine, VA Medical Center (Minneapolis) & U of MN School of Medicine

Bertram Kasiske, MD
Professor of Medicine, U of MN School of Medicine; Chief of Nephrology, Department of Medicine, HCMC

Suying Li, PhD
Health policy, USRDS

Jiannong Liu, PhD
Biostatistics, USRDS

Lih-Wen Mau, PhD
Health policy, USRDS

Marshall McBean, MD, MSc
Professor & Department Head, Department of Health Management & Policy, U of MN School of Public Health

Anne Murray, MD, MSc
Associate Professor of Medicine, U of MN School of Medicine; Staff Geriatrician, HCMC

Jon Snyder, PhD
Epidemiology, USRDS; Adjunct Assistant Professor, U of MN School of Public Health
individuals for detailed evaluation and intervention. The data we present here indicate that the CKD population is under-recognized, and that care of both the CKD population as a whole and of those patients transitioning to ESRD is less than optimal; both issues may contribute to the increased morbidity and mortality of this high-risk population.

The CKD education benefit for Medicare patients begins in 2011, with the intent to improve access to care, modality selection, consideration of home therapies, access to preemptive transplant, planned vascular access, management of risk factors, and referral to nephrologists and nutritional counseling. We plan to follow trends in these key aspects of care to determine the impact of this new benefit, and to examine how it might affect the high first-year mortality among hemodialysis patients.

The USRDS website, Researcher’s Guide, database, and administrative oversight are described in the introduction to Volume Two.

Maps in the ADR present data divided into quintiles. In the sample map, for example, approximately one-fifth of all data points have a value of 10.8 or above. Ranges include the number at the lower end of the range, and exclude that at the upper end (i.e., the second range here is 8.2–<9.2). To facilitate comparisons of maps for different periods, we commonly apply a single legend to each map in a series. In this case the data in each individual map are not evenly distributed, and a map for a single year may not contain all listed ranges. Numbers in gray indicate the mean values of data points in the highest and lowest quintiles; these can be used to calculate the percent variation between quintiles.

The Excel page for each map (on our website and CD-ROM) includes additional data. The map-specific mean is calculated using only the population included in the map; this will usually not match data presented elsewhere in the ADR, and should be quoted with caution. The overall mean includes all patients for whom data are available, whether or not their residency is known. We also include the number of patients excluded in the map-specific mean, and the total number of patients used for the overall calculation.