

# **Current Status of the Implication of the Clinical Practice Pattern in Hemodialysis Prescription in Regular Hemodialysis Patients in Egypt (NewVally)**

## **Thesis**

Submitted for partial fulfillment of Master Degree  
in Internal Medicine

By

**Ahmed Yousef Mohommed**

*M.B.B.CH. – Cairo University*

Under Supervision of

**Prof. Dr. Gamal El Sayed Mady**

*Professor of Internal Medicine and Nephrology*

*Faculty of Medicine – Ain Shams University*

**Dr. Heba Waheid AlSa**

*assistant Professor of Internal Medicine and Nephrology*

*Faculty of Medicine-Ain Shams University*

Faculty of Medicine  
Ain Shams University

2013



## Acknowledgement

*First and foremost thanks to ALLAH, the Most Merciful.*

*I wish to express my deep appreciation and sincere gratitude to **Prof Dr. Gamal El Sayed Mady**, Professor of Internal Medicine and nephrology, Ain Shams University, for his close supervision, valuable instructions, continuous help, patience, advices and guidance. he has generously devoted much of his time and effort for planning and supervision of this study. It was a great honor to me to work under his direct supervision.*

*I wish to express my great thanks and gratitude to **Prof Dr. Heba Waheid Al Saied** assistant Professor of Internal Medicine and nephrology, Ain Shams University, for her kind supervision, indispensable advice and great help in this work.*

*I wish to express my great thanks and gratitude to **Dr. Yahya Makkeyah** Lecturer of Internal Medicine and nephrology, Ain Shams University, for his kind supervision, indispensable advice and great help in this work.*

*Finally I would present all my appreciations to my patients without them, this work could not have been completed.*

**Ahmed Youssef Mohommed Ahmed**

# LIST OF CONTENTS

Title	Page No.
Introduction.....	1
Aim of The Work.....	3
REVIEW OF LITERATURE	
Chapter 1: History of Hemodialysis .....	8
Chapter 2: Hemodialysis prescription.....	8
Chapter 3: Hemodialysis associated comorbidities.....	35
Chapter 4: Guidelines for kidney diseases .....	<b>41</b>
Chapter 5: Hemodialysis in <i>Egypt</i> .....	<b>52</b>
Patients and Methods.....	<b>56</b>
Results.....	61
Discussion.....	85
Summary and conclusion.....	95
Recommendations .....	100
References .....	101
Arabic Summary .....	----

## LIST OF TABLES

<b>Table No.</b>	<b>Title</b>	<b>Page</b>
<b>Table (1):</b>	Elements of Hemodialysis Prescription .....	9
<b>Table (2):</b>	Gender and age distribution in the study population .....	61
<b>Table (3):</b>	Different causes of ESRD in the study population .....	62
<b>Table (4):</b>	Different comorbidities in the study population .....	63
<b>Table (5):</b>	Work status in the study population.....	64
<b>Table (6):</b>	Dependancy status in the study population.....	66
<b>Table (7):</b>	Frequency of HD sessions/week in the study population .....	67
<b>Table (8):</b>	Duration of HD session in the study population.....	68
<b>Table (9):</b>	Sponsoring status in the study population .....	69
<b>Table (10):</b>	Type of vascular access in the study population.....	70
<b>Table (11):</b>	Frequency of access failure in the study population .....	71
<b>Table (12):</b>	The levels of Hemoglobin.....	72
<b>Table (13):</b>	Hemoglobin category in the study population .....	72
<b>Table (14):</b>	History of blood transfusion in the study population.....	73
<b>Table (15):</b>	Different types of ESA used by the study population.....	75
<b>Table (16):</b>	History of iron injection in the study population .....	76
<b>Table (17):</b>	History of vitamines use in the study population.....	77
<b>Table (18):</b>	The levels of Calcium .....	78
<b>Table (19):</b>	Calcium levels in the study population .....	78

## **LIST OF TABLES (Cont....)**

<b>Table No.</b>	<b>Title</b>	<b>Page</b>
<b>Table (20):</b>	Different types of phosphorus binders used by the study population .....	79
<b>Table (21):</b>	Types of complications during HD session in the study population. ....	80
<b>Table (22):</b>	Viral status in the study population.....	81
<b>Table (23):</b>	Criteria of dialyzer used in the study population .....	82
<b>Table (24):</b>	Criteria of dialysate used in the study population.....	82
<b>Table (25):</b>	Different anticoagulation used in study population. ....	83
<b>Table (26):</b>	Dry weight & weight gain in study population.....	84

## LIST OF FIGURES

<b>Figure No.</b>	<b>Title</b>	<b>Page</b>
<b>Figure (1):</b>	Mechanisms of solutes removal in hemodialysis .....	12
<b>Figure (2):</b>	Comparison of urea clearance rates between low- and high-efficiency hemodialyzers .....	18
<b>Figure (3):</b>	Water permeability of a membrane and control of volumetric ultrafiltration in hemodialysis.....	21
<b>Figure (4):</b>	Pathways of thrombogenesis in extracorporeal circuits .....	25
<b>Figure (5):</b>	The development of clinical practice guidelines .....	43
<b>Figure (6):</b>	Gender distribution in the study population .....	61
<b>Figure (7):</b>	Different causes of ESRD in the study population .....	62
<b>Figure (8):</b>	Different comorbidities in the study population .....	64
<b>Figure (9):</b>	Work status in the study population .....	65
<b>Figure (10):</b>	Dependancy status in the study population.....	66
<b>Figure (11):</b>	Frequency of HD sessions/week in the study population ...	67
<b>Figure (12):</b>	Duration of HD session in the study population.....	68
<b>Figure (13):</b>	Sponsoring status in the study population .....	69
<b>Figure (14):</b>	Type of vascular access in the study population.....	70
<b>Figure (15):</b>	Frequency of access failure in the study population.....	71
<b>Figure (16):</b>	Hemoglobin category in the study population.....	73
<b>Figure (17):</b>	History of blood transfusion in the study Population .....	74
<b>Figure (18):</b>	Types of ESA used by the study population .....	75
<b>Figure (19):</b>	History of iron injection in the study population.....	76
<b>Figure (20):</b>	History of vitamines use in the study population .....	77

## **LIST OF FIGURES (Cont....)**

<b>Figure No.</b>	<b>Title</b>	<b>Page</b>
<b>Figure (21):</b>	Calcium levels in the study population .....	79
<b>Figure (22):</b>	Different types of phosphorus binders used by the study population. ....	80
<b>Figure (23):</b>	Types of complications during HD session in the study population. ....	81
<b>Figure (24):</b>	Viral status in the study population. ....	82
<b>Figure (25):</b>	): Different anticoagulation used in study population. ....	83

## LIST OF ABBREVIATIONS

Abbrev.	Full term
<b>AV</b>	Arteriovenous access
<b>BFR</b>	Blood flow rate
<b>BMI</b>	Body mass index
<b>BP</b>	Blood pressure
<b>BUN</b>	Blood Urea Nitrogen
<b>CAPD</b>	continuous ambulatory peritoneal dialysis
<b>CAPR</b>	Cardiopulmonary recirculation
<b>CKD</b>	Chronic kidney disease
<b>CMS</b>	US Centers for Medicare and Medicaid Services
<b>CPG</b>	clinical practice guidelines
<b>CRP</b>	C- reactive protein
<b>CVC</b>	Chronic venous catheter
<b>CVD</b>	Cardiovascular disease
<b>DFR</b>	Dialysate flow rate
<b>DM</b>	Diabetes mellitus
<b>DOPPS</b>	Dialysis outcome and practice pattern study
<b>ERA-EDTA</b>	the European Renal Association-European Dialysis and Transplantation association
<b>ESRD</b>	End stage renal disease
<b>GFR</b>	Glomerular filtration rate
<b>GraDe</b>	Grades of recommendation assessment, Development, and evaluation
<b>HBV</b>	Hepatitis B Virus
<b>HCV</b>	Hepatitis C Virus



## **LIST OF ABBREVIATIONS (Cont....)**

<b>Abbrev.</b>	<b>Full term</b>
<b>HD</b>	Hemodialysis
<b>HDF</b>	Hemodiafiltration
<b>HF</b>	Hemofiltration
<b>HTN</b>	Hypertension
<b>IPD</b>	Intermittent peritoneal dialysis
<b>K/DOQI</b>	Kidney Disease Outcome Quality Initiative
<b>KDIGO</b>	Kidney disease improving global outcomes
<b>KOA</b>	The mass transfer area coefficient
<b>MIA</b>	Malnutrition -Inflammation atherosclerosis (MIA) Syndrome
<b>MICS</b>	‘malnutrition–inflammation complex syndrome’
<b>MOH</b>	Ministry of health
<b>NKF</b>	National Kidney Foundation
<b>PEM</b>	Protein energy malnutrition
<b>QIP</b>	Quality improvement programs
<b>RRT</b>	Renal replacement therapy
<b>SRI</b>	Solute removal index
<b>TMP</b>	Transmembrane pressure
<b>TNF</b>	Tumor necrosis factor
<b>UF</b>	Ultrafiltration
<b>UKM</b>	Urea kinetic modeling
<b>UpstHD</b>	Urea posthemodialysis
<b>UpstHD</b>	Urea prehemodialysis
<b>URR</b>	Urea reduction ratio
<b>2M</b>	Beta 2 microglobulin
<b>(K<sub>uf</sub>)</b>	The ultrafiltration coefficient

## INTRODUCTION

**S**tudies examining the link between research evidence and clinical practice have consistently shown gaps between the evidence and current practice. Some studies in the United States suggest that 30%-40% of patients do not receive evidence-based care, while in 20% of patients care may be not needed or potentially harmful. However, relatively little information exists about how to apply evidence in clinical practice, and data on the effect of evidence-based guidelines on knowledge uptake, process of care or patient outcomes is limited .(*Locatelli et al., 2004*)

Appropriately then, the care of dialysis patients has been the prime focus of nephrology, particularly after the widespread availability of maintenance dialysis when it became evident that mortality of dialyzed patients was high and their quality of life far from adequate.(*Eknoyan et al,2002*)

Guidelines practiced on anemia and actual practices are much different with different places and patients according to treatment. Moreover, in individual countries and individual units within countries local circumstances relating to economic conditions; organization of health care delivery or even legal

constraints may render the immediate implementation of best practice guidelines difficult or impossible. Nevertheless, they provide a goal against which progress can be measured. (*Locatelli et al., 2004*)

Compliance with clinical guidelines is an important indicator of quality and efficacy of patient care , at the same time their adaptation in clinical practice may be initiated by numerous factors including; clinical experts, patient performance, constrains of public health policies, community standard, budgetary limitation and methods of feeding back information concerning current practice. (*Cameron, 1999*)

End-stage renal disease (ESRD) is one of the main health problems in Egypt. Currently, hemodialysis represents the main mode for treatment of chronic kidney disease stage 5 (CKD5), previously called ESRD or chronic renal failure .(*Afifi ,1999*)

Although hemodialysis is often used for treatment of ESRD, no practice guidelines are available in Egypt. Healthcare facilities are seeking nowadays to develop practice guidelines for the sake of improving healthcare services. (*Ministry of Health and Population,1999*)

## **AIM OF THE WORK**

**T**o study the pattern of current clinical practice in hemodialysis prescription in regular hemodialysis patients in Egypt and to compare this pattern with standard international guidelines in hemodialysis prescription , stressing on anemia, bone disease management and adequacy of dialysis.

## History Of Hemodialysis

**M**any have played a role in developing dialysis as a practical treatment for renal failure, starting with Thomas Graham of Glasgow, who first presented the principles of solute transport across a semipermeable membrane in 1854. (**Graham T. 1861**)

The artificial kidney was first developed by Abel, Rountree, and Turner in 1913. ( **Abel JJ., et al 1913**).

the first hemodialysis in a human being was by Hass (February 28, 1924), and the artificial kidney was developed into a clinically useful apparatus by Kolff in 1943 - 1945.

Willem Kolff was the first to construct a working dialyzer in 1943. The first successfully treated patient was a 67-year-old woman in uremic coma who regained consciousness after 11 hours of hemodialysis with Kolff's dialyzer in 1945. At the time of its creation, Kolff's goal was to provide life support during recovery from acute renal failure. After World War II ended, Kolff donated the five dialyzers he had made to hospitals around the world, including Mount Sinai Hospital, New York. Kolff gave a set of blueprints for his hemodialysis machine to George Thorn at the Peter Bent Brigham Hospital in Boston. This led to the manufacture of the next generation of Kolff's dialyzer, a stainless steel Kolff-Brigham dialysis machine. (**Kolff, W. J., and Berk, H. T. J, 1944**).

According to McKellar (1999), a significant contribution to renal therapies was made by Canadian surgeon Gordon Murray with the assistance of two doctors, an undergraduate chemistry student, and research staff. Murray's work was conducted simultaneously and independently from that of Kolff. Murray's work led to the first successful artificial kidney built in North America in 1945–46, which was successfully used to treat a 26-year-old woman out of a uraemic coma in Toronto. The less-crude, more compact, second-generation "Murray-Roschlau" dialyser was invented in 1952–53, whose designs were stolen by German immigrant Erwin Halstrup, and passed off as his own (the "Halstrup–Baumann artificial kidney").

By the 1950s, Willem Kolff's invention of the dialyzer was used for acute renal failure, but it was not seen as a viable treatment for patients with stage 5 chronic kidney disease (CKD). At the time, doctors believed it was impossible for patients to have dialysis indefinitely for two reasons. First, they thought no man-made device could replace the function of kidneys over the long term. In addition, a patient undergoing dialysis suffered from damaged veins and arteries, so that after several treatments, it became difficult to find a vessel to access the patient's blood. (McKellar, S,1999).

The original Kolff kidney was not very useful clinically, because it did not allow for removal of excess fluid. Swedish professor Nils Alwall encased a modified version of this kidney inside a stainless steel canister, to which a negative pressure could be applied, in this way effecting the first truly practical application of hemodialysis, which was done in 1946 at the University of Lund. Alwall also was arguably the inventor of the arteriovenous shunt for dialysis. He reported this first in 1948 where he used such an arteriovenous shunt in rabbits. Subsequently he used such shunts, made of glass, as well as his canister-enclosed dialyzer, to treat 1500 patients in renal failure between 1946 and 1960, as reported to the First International Congress of Nephrology held in Evian in September 1960. Alwall was appointed to a newly created Chair of Nephrology at the University of Lund in 1957. Subsequently, he collaborated with Swedish businessman Holger Crafoord to found one of the key companies that would manufacture dialysis equipment in the past 50 years, Gambro. The early history of dialysis has been reviewed by Stanley Shaldon **(Shaldon S. 2002)**.

Belding H. Scribner, working with the surgeon Wayne Quinton, modified the glass shunts used by Alwall by making them from Teflon. Another key improvement was to connect them to a short piece of silicone elastomer tubing. This formed the basis of the so-called Scribner shunt, perhaps more properly