T-Scores, FRAX, Frailty, Falls, and Its Relationship to Fractures in Patients on Maintenance Hemodialysis

UNDERLINE MARYAM JAFARI[1] , BHANU PRASAD [2] , SALMAN ANWAR [2] , KAVAL KOUR[1], SHUBRANDU SANJOY [3], KUNAL GOYAL[2], ADITI SHARMA[1]

1 Dr. T. Bhanu Prasad Med Prof Corp, Regina, 2 Regina General Hospital, SHA 3 Research Department, Regina, SHA

1-INTRODUCTION

Most fracture risk assessments in hemodialysis (HD) populations are based on measurements of T-scores and Fracture Risk Assessment Tool (FRAX®). Frailty (characterized by a syndrome of decreased physiological reserve to stressors that increases the vulnerability to adverse health outcomes) and falls are well-established predictors of fracture in chronic kidney disease (CKD) and non-CKD populations. However, there is a paucity of data to the additional contributions of frailty status and a history of falls in assessing the relationship with fracture HD population.

Objective:

To evaluate the clinical utility of adding FRAX score, frailty status, and falls to T-scores at the femoral neck to determine if it enhances fracture discrimination in HD patients.

2-A METHODS

Design:
- Cross-sectional study on 131 adults on maintenance HD at 2 dialysis units in Regina, Canada (Jan 2017 – Dec 2018).

Measures:
Fracture:
- Presence of self-reported non-traumatic fracture confirmed by medical charts.
- Vertebral fractures (detected by lumbar spine x-ray) to capture unreported fractures.

T-score:
- Areal bone mineral density (BMD) (g/cm^2) measured by dual-energy x-ray absorptiometry at femoral neck **(Figure 1).**

WHO definitions of BMD categories:
- Normal bone density (T-score ≥ –1.0)
- Low bone mass (T-score –1.0 and –2.5)
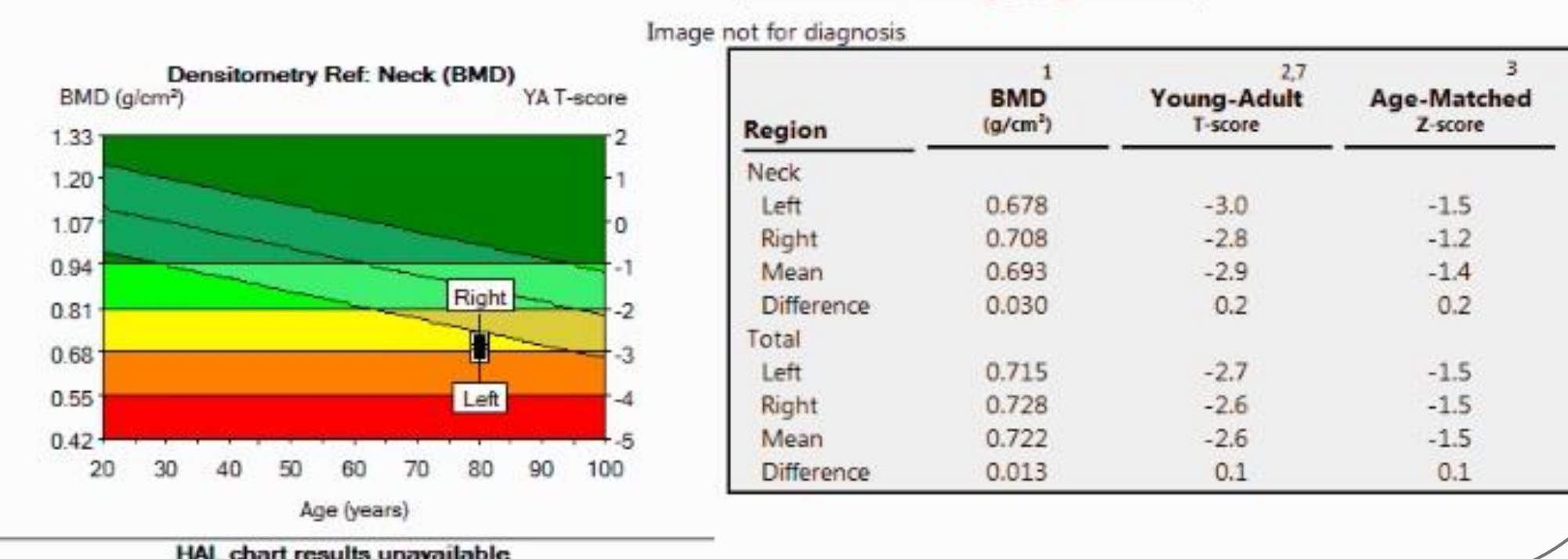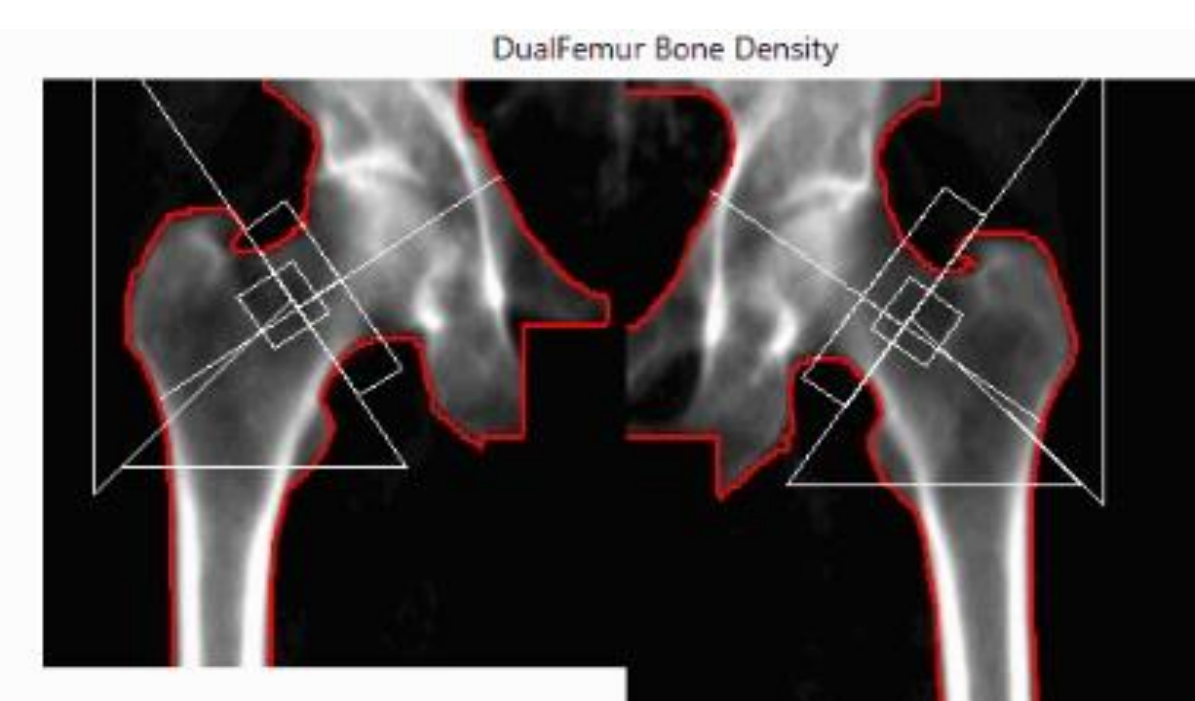- Osteoporosis (T-score ≤ –2.5)

Figure 1

2-B METHODS

FRAX®:
- FRAX score: 10-year probabilities of hip or a major osteoporotic fracture
- Online tool: 11 clinical risk factors with/ or without BMD at femoral neck

Frailty: measured using the Fried Criteria (5 physical criteria) **(Figure 2)**

History of Falls: was self reported

Demographic, Comorbidities, Lab data

Frail: ≥ 3
Pre-frail :1-2
Robust: 0

Figure 2
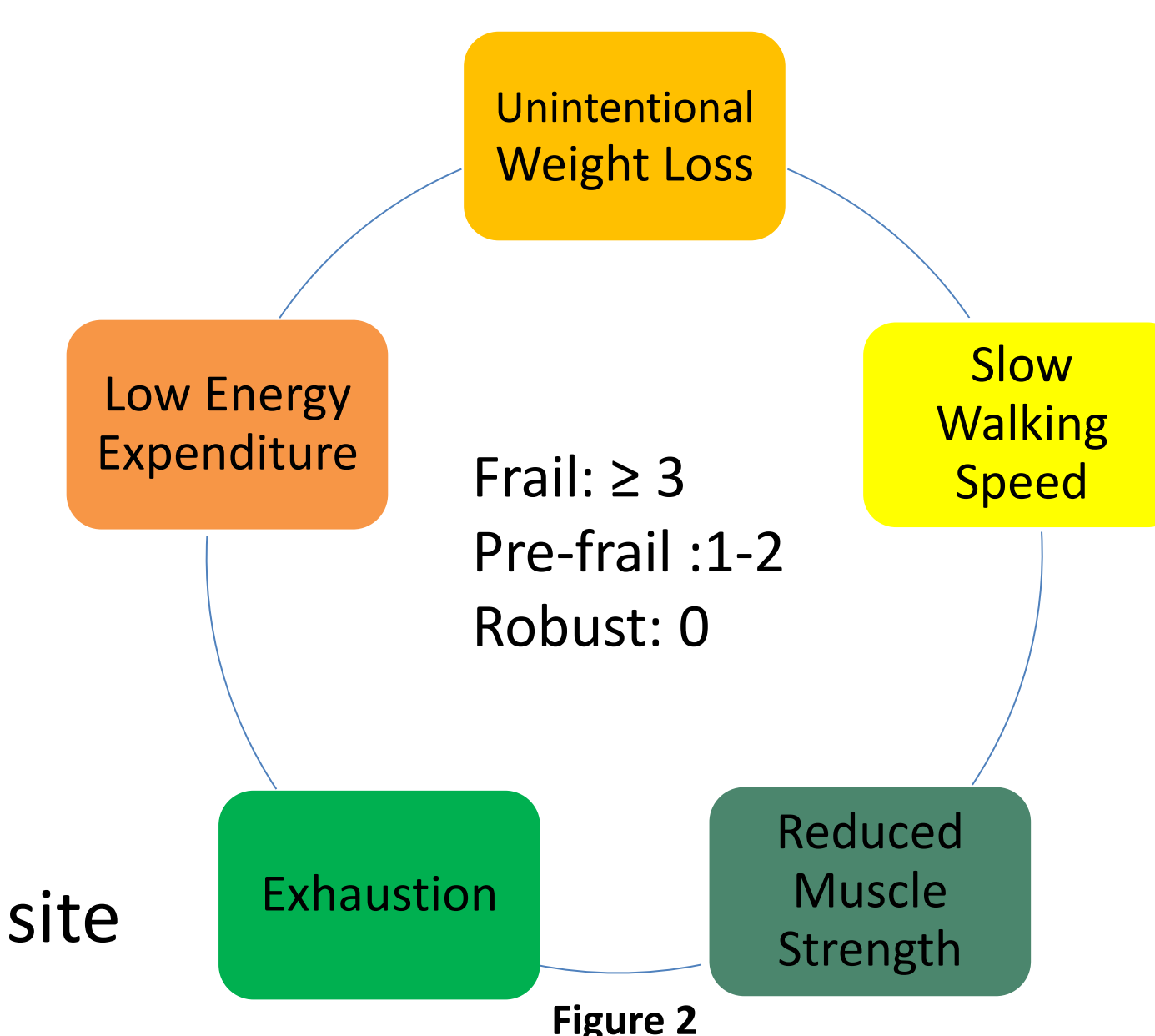
Outcome: Presence of fracture at any site

Statistical Analysis:
Sequential multivariable logistic regression models examined the association between T-score, FRAX score, frailty status and falls, with fracture (α=0.05)

AUC analysis was conducted for each model to assess its discrimination ability for fracture outcome (α=0.05)

3-RESULTS

109 patients included in data analysis. **Table 1** shows the patients' characteristics.

Table 1	N=109
Age, years, mean (SD)	63 (14)
Male, No (%)	67 (61.5)
Caucasian, No (%)	77 (71)
Time on dialysis, months, median (IQR)	34.0 (13.0-67.0)
Femoral neck T- score, median (IQR)	-2.30 (-2.90, -1.63)
Femoral neck BMD (g/cm^2), mean (SD)	0.79 (0.18)
FRAX score for hip fracture w/o BMD, median (IQR)	1.75 (0.50, 6.88)
FRAX score for hip fracture with BMD, median (IQR)	2.75 (1.08-5.30)
Frailty:	
Frail, No (%)	64 (59)
Pre-frail, No (%)	36 (33)
Robust, No (%)	8 (7)
History of falls during the last year, No (%)	31 (29)
Composite of fracture (self-reported, lumbar x ray), No (%)	41 (38)

Table 2 shows the results of multivariable logistic regression models and AUC (hip).
- Each lower SD in femoral neck T-score was associated with 48% higher odds of fracture (OR = 1.48; 95% CI 1.20-1.68, P = 0.005).
- With the inclusion for FRAX score (hip), the OR for fracture remained significant at 1.38 (OR = 1.38, 95% CI 1.04-1.63, P = 0.04).

Table 2	Model 1		Model 2		Model 3		Model 4	
	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value
Femoral neck T score	1.48 (1.20-1.68)	0.005	1.38 (1.04-1.63)	0.04	1.38 (1.03-1.63)	0.04	1.35 (0.97-1.62)	0.08
FRAX score for hip fracture	-		1.13 (1.04-1.26)	0.008	1.14 (1.04-1.26)	0.009	1.15 (1.05-1.27)	0.007
Frailty status	-		-		1.00 (0.39-2.53)	0.99	0.93 (0.35-2.46)	0.88
History of falls	-		-		-		2.30 (0.86-6.33)	0.09
AUC (95% CI)	0.67 (0.57-0.78)		0.73 (0.63-0.83)		0.73 (0.62-0.83)		0.74 (0.64-0.84)	

Frailty status: frail vs non-frail; non-frail (pre-frail + robust); OR: odds ratio

4-CONCLUSIONS.

Our study adds to the emerging literature that both T-scores and FRAX scores are associated with fracture in patients on HD. The addition of frailty status and history of falls is not associated with fractures in this population.

Limitations: Small sample size, cross-sectional study.