

Duration of military service is associated with decision quality in Veterans considering total knee replacement: case series

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Purpose: Due to the nature of military service, the patient–physician relationship in Veterans is unlike that seen in civilian life. The structure of the military is hypothesized to result in barriers to open patient–physician communication and patient participation in elective care decision-making. Decision quality is a measure of concordance between a chosen treatment and the aspects of medical care that matter most to an informed patient; high decision quality is synonymous with patient-centered care. While past research has examined how age and other demographic factors affect decision quality in Veterans, duration of military service, rank at discharge, and years since discharge have not been studied.

Patients and methods: We enrolled 25 Veterans with knee osteoarthritis at a VA hospital. Enrollees completed a survey with demographic, military service, and decision-making preference questions and the Hip-Knee Decision Quality Instrument (HK-DQI), which measures patients' knowledge about their disease process, concordance of their treatment decision, and the considered elements in their decision-making process.

Results: The HK-DQI knowledge score had a significant, positive correlation with duration of military service ($R^2=0.36$, $p=0.004$). Rank at discharge and years since discharge did not show a significant correlation with decision quality ($p=0.500$ and $p=0.317$, respectively). The concordance score did not show a statistically significant correlation with rank, duration of service, and years since discharge ($p=0.640$, $p=0.486$ and $p=0.795$, respectively). Additionally, decision process score was not significantly associated with rank, duration of military service, and years since discharge ($p=0.380$, $p=0.885$, and $p=0.474$, respectively).

Conclusion: Decision quality in Veterans considering treatment for knee osteoarthritis appears to be correlated positively with duration of military service. These findings may present an opportunity for identification of Veterans at most risk of low decision quality and customization of shared decision-making methods for Veterans by characteristics of military service.

Keywords: Veterans, decision-quality, orthopaedics, knee osteoarthritis

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Introduction

Active-duty military patients experience a unique environment in health care decision-making.¹ Military service requires the subordination of the desires and interests of the individual to the needs of the service.² Promoted in various military settings and campaigns, the message of “service above self” is a tenet based on the presumption of obedience.¹ This obedience is not only presumed but also codified in regulations that dictate medical decisions made for military patients based on the

interests of the nation and command.^{3,4} Additionally, rank or role within the military hierarchy often creates an environment of limited autonomy in medical decision-making.⁵ Due in part to medical expertise, but also to their rank as field grade or senior officers, physicians command a level of authority that places medical decision-making under unique pressures which accentuate the existing power imbalance between patient and physician.¹ The behaviors associated with military service may have a lasting effect on the way Veterans engage in healthcare decision-making after their discharge from the military and impede their access to patient-centered care.⁶

It has been reported that Veterans will defer to physician-directed decision-making over self-directed decision-making with a 2:1 ratio.⁷ Additionally, Veterans are significantly more likely to defer to physician-directed treatment and have lower decision quality scores than civilian patients.^{6,8} Previous research directed toward understanding decision quality in the Veteran population has shown differences based on patient demographics (age, race, gender, and socioeconomic status) for non-orthopedic conditions. However, little evidence exists identifying factors associated with military service that may contribute to this disparity in Veterans' decision quality.^{9,10} Length of overall service, highest rank obtained in service, and time since discharge are all critical components of a Veteran's service record and may illuminate important components of decision style and quality.

Veterans with knee osteoarthritis who are considering a total knee replacement surgery offer an ideal population to study the effect of these factors on decision quality. Knee osteoarthritis is often classified as a preference-sensitive condition, in which a patient has more than one valid treatment option with substantial pros and cons to consider.¹¹⁻¹⁴ Additionally, knee osteoarthritis is prevalent in Veterans, due to the average higher age of the population, and total knee replacement surgeries are associated with a high financial burden for the VA. In 2014, 9,153 Veterans received a total knee replacement, ranking this in the top five surgical procedures in the VA.¹⁵ In the United States, total knee replacements have an average per-procedure cost of \$31,124, indicating an estimated cost to the VA of about \$284 million per year.¹⁶

Our objective was to assess a cohort of Veterans with knee osteoarthritis using a validated survey instrument to evaluate how factors relating to their service record impacted decision quality. Our goal was to better understand the important characteristics of a Veteran's role and

time in the military in order to inform an effective patient-centered decision model at the VA.

Methods

Study subjects

We obtained IRB approval and then enrolled Veterans prospectively with knee osteoarthritis consecutively over a 6-month period at the White River Junction VA (WRJVA) in Vermont. Candidates were scheduled for a single, extended (1 hr total) visit with an orthopedic surgeon in the orthopedic clinic to allow for Veteran education, consent, and data collection.

Inclusion criteria consisted of a diagnosis of knee (ICD-9 715.96) osteoarthritis without prior treatment and without preexisting contraindications to nonsurgical and surgical osteoarthritis treatments.

We excluded patients if they had inflammatory arthritis, concomitant hip, and knee pain, prior joint replacement, or if they had sensory, cognitive, or other impairment that precluded informed consent.

We conducted a sample size calculation using PS 3.1.6 (Vanderbilt University, Nashville, TN, USA) with an alpha of 0.05 and a power of 0.8 based on our primary outcome of decision quality. We determined that 13 patients were needed to sufficiently power our analysis. Twenty-five (25) patients were enrolled in the cohort after meeting the study criteria. Twenty-four (24) patients were male, and one was female. Please see [Table 1](#) for a compilation of cohort demographic measures and distributions.

Study questionnaire

Patients enrolled in the cohort underwent informed consent to participate in a pre- and post-visit survey. The primary survey administered to assess decision quality was the Hip and Knee Osteoarthritis Decision Quality Instrument (HK-DQI). The HK-DQI is a validated instrument with 16 questions measuring patients' understanding of their disease, treatment options, and expected treatment benefits with an emphasis on joint replacement.¹⁷ The questionnaire is scored in 3 domains (knowledge score, concordance, and decision process).¹⁷

The knowledge score reflects the patient's understanding about evidence-based facts surrounding osteoarthritis and available treatments on a scale of 0–100%. The concordance section has patients rate their goals and concerns and then select which treatment they choose to treat their knee osteoarthritis (surgery vs nonsurgery). Patients are

Table 1 Cohort characteristics based on highest service rank achieved^a

Characteristics	Junior enlisted E1-E4 (n=9)	Senior enlisted/officer E5-E10, O-1 (n=13)	p-value
Age Mean, Median (SD) IQR (Min-Max)	61.6, 63 (8.3) 13 (47–71)	67.5, 69 (15.1) 8 (37–85)	0.301 [#]
Sex Chi-square value Male (%) Female (%)	1.513 8 (89) 1 (11)	13 (100) 0 (0)	0.219 ^x
Race/Ethnicity Chi-square value White, non-Hispanic (%) American Indian (%) Asian or Pacific Islander (%) Hispanic, Black (%) Hispanic White (%) Prefer not to answer (%)	4.480 8 (89) 0 (0) 0 (0) 0 (0) 0 (0) 1 (11)	9 (69) 1 (8) 1 (8) 1 (8) 1 (8) 0 (0)	0.483 ^x
Education Chi-square value High school or less (%) Bachelor's degree (%) Advanced degree (%)	1.530 5 (63) 2 (25) 1 (12)	8 (62) 3 (23) 2 (15)	0.678 ^x
Service characteristics Active service Mean, median (SD) IQR (Min-Max) Years since discharge Mean, Median (SD) IQR (Min-Max)	3.7, 2 (0.9) 2 (2–10) 36.9, 38 (11.5) 15 (20–52)	8.6, 6 (1.9) 6 (2–23) 39.2, 47 (19.5) 33 (6–64)	0.056 [#] 0.751 [#]
HK-DQI^b components Knowledge score Mean, median (SD) IQR (Min-Max) Decision process score Mean, Median (SD) IQR (Min-Max) Concordance score ^c Mean (SD)	49%, 40% (18) 20% (20–80) 38%, 20% (44) 80% (0–100) 44% (53)	45%, 40% (26) 40% (0–100) 57%, 60% (39) 60% (0–100) 38% (51)	0.673 [#] 0.296 [#] 0.791 [#]

Notes: ^xChi-square test. [#]Student's *t*-test. ^aTotal cohort of 25 patients, 3 patients opted not to report rank. ^bHip and Knee Osteoarthritis Decision Quality Instrument. ^cConcordance score was calculated by a simple match. E1-E4 and E5-E10, O1 refer to military pay codes corresponding to rank.

Abbreviations: SD, standard deviation; IQR, interquartile range; Min, minimum; Max, maximum.

scored on whether their preference matched the treatment they received (0–100%). The decision process section asks patients to complete questions regarding the interaction between the patient and the provider with answers scored on a scale of 0–100%.

Demographic information, survey results, and decision choices were recorded and entered into MS Excel spreadsheet (Microsoft, Redmond, WA, USA). Included in demographic information were categorical data regarding prior military service, rank, discharge status, and education level.

Data analysis

Statistical analysis was performed using Stata 13.0 statistical software (Statacorp, College Station, TX, USA) and R 3.3 statistical software (R Foundation, Vienna, Austria). Continuous variables were assessed for normal distribution and evaluated using parametric tests (Student's *t*-test or ANOVA) or nonparametric tests (Kruskal–Wallis). Additionally, survey scores were compared with paired *t*-tests to evaluate significance in change and correlation of variables associated with change. Categorical variables were tested using χ^2 or Fisher's exact test.

Simple and multiple regression models were constructed for the outcome measures associated with each domain of the HK-DQI. Logistic regression was performed for concordance as this was a direct match dichotomous variable.

Exposures were assessed for potential confounding, and effect rates were analyzed in both crude and adjusted forms. This was particularly important, given the potential pitfalls in stratifying results from related variables of time in service, rank, and education level. Specifically, increases in education level and time in service can be directly correlated with increase in rank.

Results

Decision quality

Total knowledge score did not have a significant association with highest rank achieved in the military or years since discharge from the military ($p=0.500$ and $p=0.317$, respectively). (Figure 1) There was, however, a significant association between years of service and knowledge score. This significance was present in crude analysis ($R^2=0.36$, $p=0.017$) and when adjusted for potential confounders of rank, years since discharge and education level ($R^2=0.42$, $p=0.023$). (Figure 2) Based on

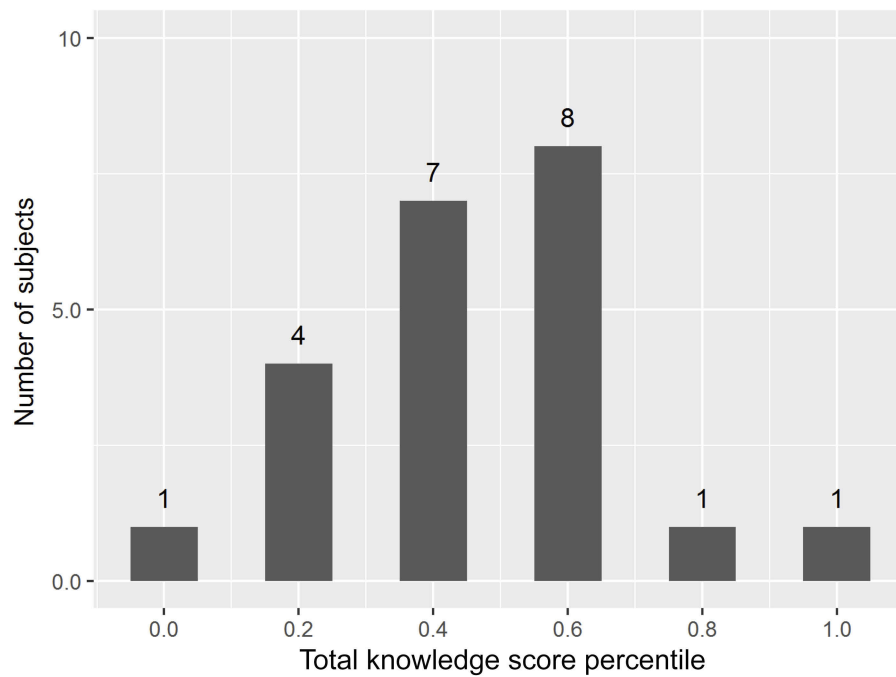


Figure 1 Knowledge score distribution within cohort histogram representing the overall breakdown of the total knowledge score of the hip and knee osteoarthritis decision quality instrument (HK-DQI). The greatest number of subjects (8) scored in the 0.6 (or 60%) percentile.

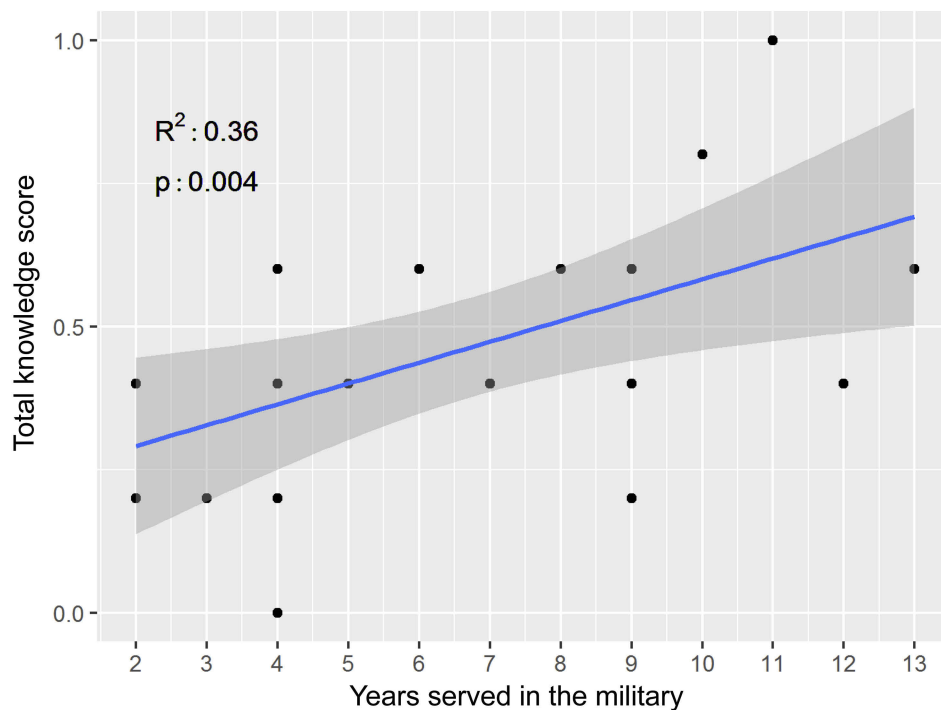


Figure 2 Association of knowledge score and duration of military service correlation plot showing the significant association between increasing total knowledge score with increased number of years served in the military. The R^2 of 0.36 shows the amount of variance in total knowledge score accounted for by years served in the military. With a p -value of 0.004, this represents a significant association.

the coefficient from the regression model, for each year that a Veteran spent in active service, there was a corresponding increase of knowledge score of 3.4% ($p=0.023$).

Additionally, knowledge score was significantly associated with graduate education level in crude analysis and when adjusted for rank, years of service, and years since discharge ($p=0.014$).

Table 2 Service characteristics and HK-DQI results

Exposure	Knowledge score		Concordance		Decision process	
	β (regression coefficient)	SE	β	SE	β	SE
Years in service	0.034*	0.012	-0.037	0.041	-0.014	0.029
Years since discharge	<0.001	0.002	-0.001	0.022	-0.003	0.006
Rank of E-5 or Higher	-0.098	0.079	0.050	0.271	0.222	0.445
Graduate degree	0.355*	0.125	0.152	0.132	0.383	0.309

Note: **p*-value <0.05. Multivariate regression model measuring characteristics of the veteran cohort and the significant association of each characteristic with respect to the overall scores on the Hip and Knee Osteoarthritis Decision Quality Instrument (HK-DQI). Significant associations are marked with*.

The HK-DQI concordance score was not significantly associated with any of the primary exposure variables in the adjusted logistic regression model. Rank, years in service, years since discharge, and education level demonstrated no significant association with the concordance outcome ($p=0.640$, $p=0.486$, $p=0.795$ and $p=0.174$, respectively).

Decision process score was not significantly associated with any of the primary exposure variables in the adjusted regression model. No significant association with the decision process outcome was demonstrated for rank ($p=0.380$), years in service ($p=0.885$), years since discharge ($p=0.474$), or education level ($p=0.067$). A summary of main effects of the covariates on decision quality outcomes is seen in Table 2.

Discussion

Patient-centered care is designed to facilitate health care based upon the best available evidence and match treatment with patients' individual goals and beliefs while establishing realistic expectations for outcome.^{8,14,18,19} While there are numerous facets to patient-centered care, the single best indicator of patient-centered care is decision quality.^{20,21} High decision quality requires two essential components: 1) patients' decisions are based on the best available evidence; 2) patients' decisions are consistent with the treatment endpoints that matter most to each individual patient.^{17,21}

The disparities between a collaborative, patient-centered process compared to a process in which physicians direct treatment decisions have been well established. Physician-directed treatment is known to yield increased surgical rates and anxiety, as well as reduced decision quality and patient satisfaction following treatment.^{12,14,17,18,22-27} Furthermore, research supports that surgeons are often poor patient educators, accentuating the need for a formal process to inform patients' decisions when considering surgical intervention.²⁰

Previous research has demonstrated a disparity between decision quality in Veterans and the civilian population.⁶ However, no previous studies have investigated how factors

relating to military service might be associated with this disparity.^{9,10} Our study attempted to fill this gap by evaluating the association between military service factors and decision quality in a cohort of Veterans seeking treatment for knee osteoarthritis. Our intent was to determine how rank, time in service, and years since discharge are associated with decision quality.²⁸ Our primary finding showed a significant association between years in service and knowledge score, a domain of the HK-DQI. Specifically, the greater the Veteran's years of service, the higher the Veteran's knowledge score. This association remained significant when adjusted for all other measured components of service record and education level. Our study also found that Veterans with post-graduate level of education had significantly better knowledge scores. This supports previous findings that show an association between education and decision quality in Veterans.¹⁰⁹

While a causal relationship cannot be concluded from our primary finding of an association between length of service and decision quality, it is important to attempt to understand the mechanism behind this association. It is possible that a greater time in service could confer a greater level of comfort in medical decision-making in a VA medical center setting. Since knowledge score measures the patient's understanding of risks, benefits, and alternatives of treatment, comfort in a setting in which a provider explains the details of treatment would convey an advantage for retaining important knowledge about treatment factors.

Additionally, the finding that greater duration of service is associated with better decision quality could conversely undermine the premise that the atmosphere of obedience stifles patient autonomy. While the Veteran's comfort in the military atmosphere may indeed improve interaction with the provider, more research is needed to determine if length of service is associated with subjugating one's treatment goals to the recommendations stated by the provider. Future research should focus on understanding the mechanism behind this association and how

to implement these findings to create a better environment for medical decision-making in the Veteran population, such as a formal shared decision-making model.

One strength of our study was the completeness of our decision data in the cohort. We obtained follow-up with Veterans to obtain survey scores and treatment decisions with 100% completion rate. Another strength was our prospective use of a validated instrument (HK-DQI) to measure decision quality. Multiple studies and instruments have been developed to evaluate the quality of decision-making in the osteoarthritis population.^{14,17,22,29} These instruments help inform providers focused on improving patient decision quality.

However, our study is not without limitations. We were able to define areas of association between decision quality and Veteran service characteristics, but we were not able to determine causality. We also note that this study is limited by the cohort size and patient demographics. Twenty-five patients were enough to power our present analysis. However, our analysis was somewhat limited as further subclassification of the cohort weakened the power of our calculations and prevented us from running a larger multivariate analysis. Additionally, our cohort was almost entirely male (24/25) and predominantly white (20/25), limiting generalizability to the population.

Although limited in the scope of its application, this study addresses a population that would benefit from structured shared decision-making and decision aids. Active duty soldiers function daily in a setting of military hierarchy and top-down communication structure. As these soldiers leave military service and begin to receive care as Veterans in VA medical centers, the degree to which their medical decision-making is affected by their comfort with authority leaves them potentially vulnerable to poorly informed or incomplete decisions.

Conclusion

Our study is the first to evaluate Veteran decision quality based on the characteristics of their military service. In our cohort of Veterans with knee osteoarthritis, we found that Veterans with longer time of military service had higher decision quality scores than those with a shorter service tenure. Rank and time since discharge were not significantly associated with overall decision quality. Overall, our study highlights an opportunity for a formal shared decision-making process to better inform Veterans and improve decision quality.

Ethics Approval

This study was approved by the Committee for the Protection of Human Subjects at Dartmouth-Hitchcock Medical Center and the Veteran's IRB of Northern New England (VINNE); study number 00028655. All enrolled participants were provided written informed consent.

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Disclosure

Dr. Ibrahim's current employment is at the Department of Healthcare Policy and Research, Weill Cornell School of Medicine, New York, NY, USA. The authors report no other conflicts of interest in this work.

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