



# IQTISODIYOT&TARAQQIYOT

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- 08.00.16 Raqamli iqtisodiyot va xalqaro raqamli integratsiya
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# COMPARISON OF HOSPITAL-BASED AND HOME-BASED REHABILITATION AFTER CERVICAL SPINE SURGERY IN UZBEKISTAN

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**Abstract.** It highlights the rehabilitation outcome variability being measured and influences how recovery pathways are evaluated and compared. Access for postoperative rehabilitation services and continuity of care at discharge is significantly affected by institutional and socioeconomic factors. The aim of this study was to identify the level of rehabilitation effectiveness and its five dimensions namely accessibility, adherence, functional recovery, patient satisfaction, and cost efficiency in postoperative cervical spine patients in Uzbekistan. The main purpose of this study was to explore patients' perceptions of their rehabilitation experiences and treatment outcomes within their early years as postoperative patients. This study used quantitative design involving an iterative process of analytical cycles: model specification, estimation, validation and refinement. A total of 120 patients from urban hospitals and home settings were purposely selected and surveyed to obtain their feedback on the rehabilitation programs they received before and after their discharge and the strategies that they employed within their recovery management process. The results indicate that the combined approach adopted in this research reasonably enabled patients to be actively engaged in their recovery process and improved functional outcomes among them. The resultant structural equation model showed a better fit to the data, providing support for the integrated application of the Heckman selection model. The findings and the implications for the improvement of patients' rehabilitation outcomes are discussed. This study provides some theoretical and practical implications for improving the patients' recovery outcomes and their long-term development which aim to enhance the healthcare qualities of future rehabilitation programs.

**Key words:** Cervical Spine Rehabilitation, Hospital-Based vs Home-Based Care, Structural Equation Modeling, Heckman Selection Model, Rehabilitation Effectiveness, Functional Recovery Outcomes, Postoperative Care in Uzbekistan.

**Annotatsiya.** Unda o'lchanayotgan reabilitatsiya natijalarining o'zgaruvchanligi ta'kidlangan va tiklanish yo'llarining qanday baholanishi va taqqoslanishiga ta'sir qiladi. Operatsiyadan keyingi reabilitatsiya xizmatlaridan foydalanish imkoniyati va davolanishdan chiqish vaqtidagi parvarishning uzluksizligiga institutsional va ijtimoiy-iqtisodiy omillar sezilarli darajada ta'sir qiladi. Ushbu tadqiqotning maqsadi O'zbekistonda operatsiyadan keyingi bachadon umurtqasi bilan og'rigan bemorlarda reabilitatsiya samaradorligi darajasini va uning beshta o'lchovini, ya'ni kirish imkoniyati, rioya qilish, funktsional tiklanish, bemorlarning qoniqishi va iqtisodiy samaradorligini aniqlash edi. Ushbu tadqiqotning asosiy maqsadi bemorlarning operatsiyadan keyingi dastlabki yillardagi reabilitatsiya tajribalari va davolash natijalari haqidagi tasavvurlarini o'rganish edi. Ushbu tadqiqotda analitik sikllarning takroriy jarayonini o'z ichiga olgan miqdoriy dizayn qo'llanildi: modelni spetsifikatsiya qilish, baholash, tasdiqlash va takomillashtirish. Shahar kasalxonalarini va uy sharoitlaridan jami 120 bemor ataylab tanlab olindi va ular davolanishdan chiqishdan oldin va keyin olgan reabilitatsiya dasturlari va tiklanishni boshqarish jarayonida qo'llagan strategiyalari bo'yicha fikr-mulohazalarini olish uchun so'rovnomaga o'tkazildi. Natijalar shuni ko'rsatadiki, ushbu tadqiqotda qo'llanilgan birlashtirilgan yondashuv bemorlarga tiklanish jarayonida faol ishtirok etish imkonini berdi va ular orasida funktsional natijalarni yaxshiladi. Olingan strukturaviy tenglama modeli ma'lumotlarga yaxshiroq mos kelishini ko'rsatdi va Heckman tanlov modelini integratsiyalashgan qo'llashni qo'llab-quvvatladi. Bemorlarning reabilitatsiya natijalarini yaxshilash bo'yicha topilmalar va oqibatlari muhokama qilinadi. Ushbu tadqiqot bemorlarning tiklanish natijalarini yaxshilash va ularning uzoq muddatli rivojlanishi uchun ba'zi nazariy va amaliy natijalarni taqdim etadi, bu kelajakdagi reabilitatsiya dasturlarining sog'liqni saqlash sifatini oshirishga qaratilgan.

**Kalit so'zlar:** Bachadon umurtqasini reabilitatsiya qilish, kasalxonada va uyda parvarish qilish, Strukturaviy tenglama modellashtirish, Hekman tanlov modeli, reabilitatsiya samaradorligi, funktsional tiklanish natijalari, O'zbekistonda operatsiyadan keyingi parvarish.



**Аннотация.** В статье освещается вариативность результатов реабилитации, измеряемая в ходе исследования, и рассматривается вопрос оценки и сравнения путей восстановления. Доступ к послеоперационным реабилитационным услугам и непрерывность ухода после выписки существенно зависят от институциональных и социально-экономических факторов. Целью данного исследования было определение уровня эффективности реабилитации и ее пяти измерений, а именно: доступности, приверженности лечению, функционального восстановления, удовлетворенности пациентов и экономической эффективности, у пациентов с послеоперационным состоянием шейного отдела позвоночника в Узбекистане. Основная цель исследования заключалась в изучении восприятия пациентами своего опыта реабилитации и результатов лечения в первые годы после операции. В исследовании использовался количественный подход, включающий итеративный процесс аналитических циклов: спецификация модели, оценка, валидация и уточнение. В общей сложности 120 пациентов из городских больниц и на дому были целенаправленно отобраны и опрошены для получения их отзывов о программах реабилитации, которые они получали до и после выписки, а также о стратегиях, которые они использовали в процессе управления своим восстановлением. Результаты показывают, что комбинированный подход, принятый в данном исследовании, позволил пациентам активно участвовать в процессе восстановления и улучшить функциональные результаты. Полученная структурная модель уравнений показала лучшее соответствие данным, что подтверждает целесообразность комплексного применения модели отбора Хекмана. В статье обсуждаются результаты и их значение для улучшения результатов реабилитации пациентов. Данное исследование предоставляет некоторые теоретические и практические рекомендации по улучшению результатов восстановления пациентов и их долгосрочного развития, направленные на повышение качества медицинской помощи в будущих реабилитационных программах.

**Ключевые слова:** Реабилитация шейного отдела позвоночника, стационарное и амбулаторное лечение, структурное моделирование уравнений, модель отбора Хекмана, эффективность реабилитации, результаты функционального восстановления, послеоперационный уход в Узбекистане.

## INTRODUCTION

Many earlier studies seem to just reproduce and apply new rehabilitation protocols presented or made available by the clinical guidelines while their empirical validation in the postoperative context is quite low [1,2,3,4].

It is only when factorial validity is clearly demonstrated that the appropriate combinations of the indicators to form latent constructs of rehabilitation variables, i.e., the structural equation model, can be fully justified and the causal relationships of outcomes from predictors determined (SEM framework) [5,7,8,10].

According to rehabilitation theory [14], functional recovery differs from clinical improvement because it does not focus on the patients' symptoms or diagnoses, but rather assumes that individuals should actively participate, adapt, improve, and maintain functional abilities in different rehabilitation settings with the aim of restoring the patient's independence. In this context, it is believed that rehabilitation is a dynamic process in which patients learn to adapt and change their physical condition to fit their functional needs and social environment, physical limitations, psychological responses and clinical conditions, which also shapes the recovery process for an individual when joining an inpatient, outpatient or home-based program [11,12,13,15]. The lack of patient involvement in a structured rehabilitation approach seems to be related to the limited availability of services in ensuring a more continuous care pathway.

In recent studies, [3,9,10,4,13] revealed that most postoperative patients noted that they had lacked support in continuity of care and have had to create their own strategies and routines to manage themselves within the recovery process.

In this regard, research into rehabilitation programs [8,11,12,6] have also highlighted that many patients will face difficulties and are not expected to effectively manage their recovery role without any structured guidance, monitoring and support systems in place within their healthcare settings.

On the contrary, other studies [7,5] have indicated that most patients had to rely on "self-directed rehabilitation" after being discharged as postoperative patients unless they received continuous support from rehabilitation specialists within their early years of recovery.

## LITERATURE REVIEW ON THE TOPIC

While the previous studies on postoperative rehabilitation and hospital-based versus home-based approaches through randomized trials and cohort analyses claim to be quite comprehensive, the implementation of these kinds of rehabilitation programs in our context raises quite significant practical challenges among patients; hence one approach does not necessarily work in every clinical setting.



Additionally, studies such as by Dow and Black [6], Abdelmowla [1], Barbosa, Ling, and Sakaguchi [2,9,11] suggest that rehabilitation strategies should be further refined. The existing research studies mostly focused on investigating the impact of rehabilitation with physiotherapy as a method of intervention; some are mentioned in systematic reviews. The structural equation model shown in prior studies is much closer to the one applied in recent research, except that selection bias was added as another variable since the focus of the present study was on the role of patient selection involved in the rehabilitation process [9,10,14].

It is widely acknowledged and supported with evidence that this kind of cross-sectional form of analysis and regression method is neither comprehensive nor sufficiently robust. There had been comments that such a model of analysis did not claim a direct relationship between rehabilitation setting and the potential of recovery outcomes out of clinical interventions [12].

Research on patients' perceptions and their rehabilitation experience needs have not been widely explored in developing countries and not many empirical studies have been conducted on these two variables, more so in the Uzbekistan context. However, given the increasing importance of rehabilitation programs, and yet the persistent dropout problems of patients dropping out of such structured programs, the present study felt that it was particularly important to also test this integrated model on the variability of outcomes found among patients in the local context as well.

As this study aimed to provide empirical evidence for the valid use of the integrated model, the research questions that guided the development of this study are as follows. As stated earlier, this study was aimed at developing a structural model applied in the context of postoperative rehabilitation [14].

By implementing hospital-based and home-based approaches, this study aims to improve current practices in a rehabilitation care system to ensure that accessibility, adherence, and cost-efficiency as well as functional recovery among postoperative patients and across healthcare settings. Given these points, the present study will at least provide more empirical insights and practical evidence for healthcare providers and policy makers with regard to patients' rehabilitation outcomes and recovery experiences and also their long-term development. In this study, we employ quantitative-based analytical activities to meet this objective whereby all measurement instruments are built on prepared and conducted surveys by the researchers.

On the basis of the framework of SEM, the effects of the rehabilitation variables (accessibility and adherence) working in combination were hypothesized to be explained by functional recovery and patient satisfaction which (a) would directly influence rehabilitation outcomes and cost efficiency, and (b) would indirectly affect recovery pathways because of selection bias. We develop a more comprehensive and robust model-based framework by incorporating several significant adjustments to the analysis such as correction bias of selection, latent variable estimation, and the use of Heckman selection model as a two-step estimation instead of as a single regression. The structural equation model shown in this study is much closer to the one applied in previous research, except that the Heckman correction was added as another variable since the focus of the present study was on the role of selection bias involved in the rehabilitation process.

## ANALYSIS AND RESULTS

The samples were chosen from a group of patients from the urban hospitals (Uzbekistan healthcare system), which was purposely selected and not according to random assignment to avoid any selection bias [1]. The data were collected using a survey-based instrument which was developed based on the operational definition of rehabilitation effectiveness, patient perception in the postoperative context.

Three rehabilitation groups of an experimental sample consisting of 60 patients in the first group and 60 patients in the second group participated in this research as part of rehabilitation program activities. These participants were chosen from the same clinical setting as the study population so that the comparisons between rehabilitation approaches of hospital-based care and the integration of home-based rehabilitation by the patients could be measured.

A total of 120 patients were also chosen from a population of postoperative patients in Uzbekistan, based on inclusion & availability [2].

From a total of 120 respondents that were randomly selected, 110 cases were found suitable, and rated by an independent evaluator. In this study, the participants were chosen through a purposive sampling method in selecting those who have characteristics that are relevant in evaluating the rehabilitation outcomes on accessibility and adherence. Second, it is the most commonly used method, and thirdly, it can be used with sample sizes of between 100 and 200 [3].

The sampling method used in this study was 'simple random sampling' where each individual in the population has the same chance to be selected as a sample [4]. This method uses a simple random procedure of selecting each individual in the sampling frame until the desired number of participants is achieved [5]. The samples were chosen from a group of patients from the urban hospitals (Uzbekistan healthcare system), which was purposely selected and not according to random assignment to avoid any selection bias [1].



These participants were chosen from the same clinical setting as the study population so that the comparison between rehabilitation outcomes of treatment approaches and the evaluation of recovery by the patients could be measured. Survey questionnaires and structured observation were used to collect quantitative data and qualitative insights and other relevant information that were revealed during the data collection process.

During the survey administration, all the responses and records were documented using a data entry system after approval was obtained from the hospital authorities. Measurements were conducted with the structural equation modeling (SEM), which is based on statistical theory by the multivariate analysis approach [3] to measure latent relationships. The model's reliability was tested using a scale constructed from the literature [6]. SEM analysis uses an iterative approach and is generally thought to involve a series of estimation procedures of the following: model specification, estimation, validation and refinement, re-specification, re-estimation, validation again, refinement again, and so on.

At the initial stage of the analysis process, several cases were randomly selected and rated by another independent evaluator. Re-specification of the model was guided by theoretical considerations and relevant empirical evidence. A research assistant administered the questionnaires during data collection when the researchers were not present in the field. The model's results of the measurement study showed that the constructs were valid and reliable [3].

A change of value in fit indices is indicative of a significant difference in models.

Model fit of the model was established by comparing the predicted covariance of the structural model to the data. Comparison of the nested models was determined primarily using the change in chi-square per change in degrees of freedom between the models. The exogenous variables were patients' demographic characteristics, the latent constructs of rehabilitation effectiveness which are accessibility, adherence, functional recovery, patient satisfaction, and cost efficiency. For a model to be identified, "a sufficient number for each of the parameters in the model" must be achieved [3].

In the last stage, conclusions were drawn based on the results and analysis. Model fit of the model was established by comparing the predicted covariance of the structural model to the data.

In this process, the responses were categorized into small units according to their themes and dimensions. All the variables were categorized and respectively assigned a code. Comparison of the nested models was determined primarily using the change in chi-square per change in degrees of freedom between the models.

Change in CFI was also used to determine differences in model fit in the SEM analyses as it has been shown to be robust [7]. The structural equation modeling for the Heckman selection model (SEM) approach was used for the data analysis, and mean, standard deviation, and frequency were used to describe the characteristics of the data. Four stages were employed to analyze the data: specification, estimation, validation and refinement as suggested by Hair and Anderson using the SEM approach. One of the advantages of using SEM is that it can measure the effect of a latent variable on the relationship between patients' rehabilitation variables and treatment outcomes among patients in the study.

The study was based on the quantitative approach in which most of the data analysis through statistical approaches. After the initial analysis, a few modifications were adopted to analyze the collected data. As the structural equation model produced poor model-data fit, it was re-specified and re-estimated. This was followed by the process of model refinement based on the modification indices and residuals that emerged from the estimation processes. The final model fit indices computed by SEM was found to be acceptable.

The findings revealed that rehabilitation effectiveness and all its five dimensions show high category means in the descriptive statistics results around 1.80. The structural equation/Heckman model produced the best fit to the data (Table 1 and 2) with no significant residuals and errors (Table 1).

**Table 1. Structural Equation Model Estimates (OIM Estimator)**

	OIM					
	Coef.	Std.Err.	z	P>z	[95%Conf.	Interval]
Structural						
rehab_dropout_risk						
digital_followup_intensity	0.416	0.080	5.230	0.000	0.260	0.572
family_care_index	0.331	0.073	4.560	0.000	0.189	0.473
functional_outcome_score	-0.109	0.016	-6.660	0.000	-0.141	-0.077
cost_efficiency_score	-0.139	0.031	-4.430	0.000	-0.201	-0.078
_cons	2.281	0.476	4.790	0.000	1.347	3.215
transport_access_score						
digital_followup_intensity	-0.365	0.138	-2.640	0.008	-0.636	-0.095

functional_outcome_score	0.112	0.035	3.240	0.001	0.044	0.180
_cons	4.420	0.623	7.090	0.000	3.198	5.642
clinical_complexity_index						
family_care_index	-0.176	0.127	-1.380	0.168	-0.425	0.074
cost_efficiency_score	0.059	0.038	1.570	0.115	-0.014	0.133
_cons	5.378	0.789	6.810	0.000	3.831	6.925
var(e.rehab_dropout_risk)	0.276	0.044	0.203	0.377		
var(e.transport_access_score)	1.538	0.243	1.128	2.097		
var(e.clinical_complexity_index)	0.999	0.158	0.733	1.362		

The equation indicates that one-unit change in adherence level would increase the level of functional recovery in the patient outcomes by 0.518, with  $p = 0.000 < 0.01$ , thus the relationship between adherence and functional recovery is significant (Table 2).

Table 2. Likelihood Ratio Model Fit Statistics for Structural Equation Model

Fit Statistic	Value	Description
$\chi^2_{(7)}$	51.296	Model vs. saturated model
p-value	0.000	Significance of $\chi^2_{(7)}$
$\chi^2_{(15)}$	126.160	Baseline vs. saturated model
p-value	0.000	Significance of $\chi^2_{(15)}$

Altogether, for the structural model it was revealed that adherence had the most significant total effect (0.518) on functional recovery, indicating that adherence was the variable that was most strongly associated with recovery outcomes, followed by accessibility (0.285), patient satisfaction (0.218), income level (0.002) and cost efficiency (0.139).

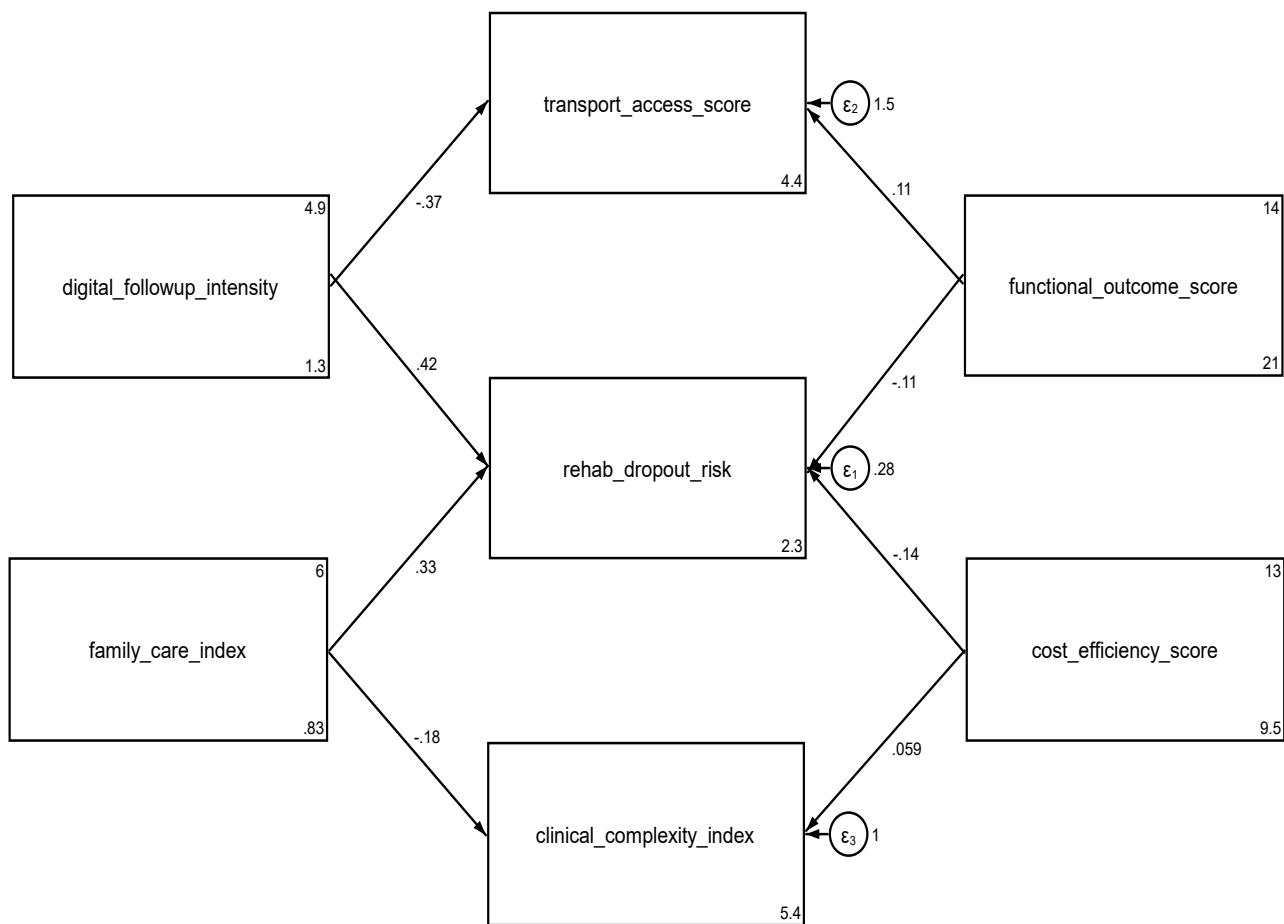
The findings in Table 3 results show that the adherence had the highest mean followed by accessibility, patient satisfaction in functional recovery model, and income level variable; the lowest was cost efficiency construct but it had the highest standard deviation (0.491) (Table 3).

Table 3. Linear regression

functional_recovery	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
accessibility	.285	.049	5.80	0	.188	.381	***
adherence	.518	.034	15.06	0	.45	.586	***
patient_satisfaction	.218	.048	4.49	0	.122	.313	***
income_level	.002	0	32.67	0	.002	.002	***
Constant	.155	.064	2.41	.017	.028	.282	**
Mean dependent var	1.806		SD dependent var	0.261			
R-squared	0.876		Number of obs	180			
F-test	308.539		Prob > F	0.000			
Akaike crit. (AIC)	-339.572		Bayesian crit. (BIC)	-323.607			
*** p<.01, ** p<.05, * p<.1							



In her initial assessment, a healthcare system faced many challenges with regard to distributing patients' rehabilitation services in which only urban hospitals were equipped with a high number of facilities, leaving behind other regions with fewer resources. In the present study, the bootstrap value for testing of the significance was obtained by running 500 resampling samples from the original data set (Figure 1).



Number of obs = 80  
 Endogenous variables  
 Observed: rehab\_dropout\_risk transport\_access\_score clinical\_complexity\_index  
 Exogenous variables  
 Observed: digital\_followup\_intensity family\_care\_index functional\_outcome\_score cost\_efficiency\_score  
 Structural equation model  
 Estimation method = ml  
 Log likelihood = -919.38806  
 LR test of model vs. saturated: chi2(7) = 51.30, Prob > chi2 = 0.0000

Figure 1. Structural Equation Model

Figure 1 provides the path coefficients and t-value statistic where the t-value greater than 1.96 is considered significant at 0.05 level. If the nested models produce better fit to the data and indicate a non-significant chi-square difference change, it can be concluded that the more parsimonious models fit better and demonstrate stability. It reported a statistically significant negative effect and supported the hypothesis, indicating that if patients experienced enhanced cost efficiency, it would have a negative effect on their dropout risk.

The model results show that when selection correction is not carried out by the estimation procedure, the effect of it as a bias correction is not significant in the relationship between accessibility and recovery outcomes,  $t(110) = -0.65, p > 0.05$ . However, between accessibility and functional recovery, the direct effect was significant, indicating that it was more significant than the indirect effect of selection bias. From Table 4 results, it is observed that all variables, with the exception of lambda, were not significantly different across the Heckman and SEM model (Table 4, 5).

Table 4. Heckman selection model -- two-step estimates

functional_recover~c	Coef.	St.Err.	t-value	p-value	[95% Conf Interval]	Sig
accessibility	.284	.048	5.89	0	.19 .379	***
adherence	.518	.034	15.29	0	.451 .584	***
patient_satisfaction	.215	.048	4.49	0	.121 .309	***
income_level	.002	0	33.09	0	.002 .002	***
Constant	.16	.064	2.51	.012	.035 .286	**
distance_to_hospital	-.206	.024	-8.76	0	-.252 -.16	***
insurance_coverage	.358	.172	2.07	.038	.02 .695	**
Constant	3.235	.391	8.28	0	2.469 4.002	***
lambda	-.012	.018	-0.65	.513	-.046 .023	
Mean dependent var	0.600		SD dependent var	0.491		
Number of obs	300		Chi-square	1268.985		

\*\*\* p<.01, \*\* p<.05, \* p<.1

Table 5. Heckman selection model

functional_recover~c	Coef.	St.Err.	t-value	p-value	[95% Conf Interval]	Sig
accessibility	.284	.048	5.89	0	.19 .379	***
adherence	.518	.034	15.28	0	.451 .584	***
patient_satisfaction	.216	.048	4.50	0	.122 .309	***
income_level	.002	0	33.09	0	.002 .002	***
Constant	.159	.064	2.50	.013	.034 .284	**
distance_to_hospital	-.207	.024	-8.78	0	-.253 -.161	***
insurance_coverage	.35	.173	2.02	.043	.011 .688	**
Constant	3.25	.392	8.30	0	2.482 4.018	***
athrho	-.095	.169	-0.56	.573	-.426 .236	
Insigma	-2.389	.053	-45.09	0	-2.493 -2.285	***
Mean dependent var	0.600		SD dependent var	0.491		
Number of obs	300		Chi-square	1268.071		
Prob > chi2	0.000		Akaike crit. (AIC)	-43.680		

\*\*\* p<.01, \*\* p<.05, \* p<.1

Finally, the standardized coefficient between cost efficiency and dropout risk was  $\beta = -0.139$  ( $t = -4.43$ ,  $p < 0.01$ ) which reported a statistically significant negative effect and supported the hypothesis, indicating that enhanced cost efficiency would have a negative effect on dropout risk.

The model summary shows that when correction bias is not carried out by the estimation model, the effect of it as a selection factor is not significant in the relationship between accessibility and functional recovery,  $t(110) = -0.65$ ,  $p > 0.05$ . For the test of significance (SEM paths), the strength of the related path between an exogenous variable and the endogenous variables is evaluated through t-value which is obtained from bootstrapping methods.

Based on this finding, it is clear that some rehabilitation strategies and patient management approaches have been influenced by the healthcare system's structural limitations to adapt in order to prepare patients with the necessary skills and knowledge in recovery management [1,2].

Overall, this model as carried out in the present study has supported the findings obtained in the previous models used in the literature (SEM framework). This resulted in the fourth change of patient outcome patterns: student learning performance was mainly determined based on their participation in class activities and learning engagement, and not dependent on their placement in the rehabilitation setting [3,4,5].



It suggests that the relationships are the same in each subgroup and allows for the comparison between groups [6,7]. The study showed that with accessibility as a predictor, the relationship between adherence and functional recovery for rehabilitation purposes was significant. Moreover, the present model showed a greater variance (0.876) in contrast to the previous model (0.600) by improved estimation procedures. As this was a cross-sectional study, it is suggested that future researchers adopt a longitudinal approach to obtain more robust findings on the relationship between accessibility and adherence and the effect of selection bias as a mediator [8,9,10].

Through the survey responses, the patients negatively remarked about the limitations related to the rehabilitation services they received, which they described as lacking in continuity from healthcare providers, follow-up monitoring and group sessions with other rehabilitation participants. Almost all students in this study (majority of participants) suggested that preparing structured rehabilitation plans for class activities helped improve their understanding of the recovery process.

This result to some extent indicates that by providing some flexibility in their rehabilitation programs, patients will learn how to be more independent and proactive in their own recovery management and thus, learn to be an active participant. As a result, we can conclude that a healthcare provider's support or ability in conducting rehabilitation programs in structured settings indirectly helps facilitate or enhance the recovery outcomes of patients in the rehabilitation process by improving adherence. Thus, it would seem that if accessibility was facilitated, their adherence would be enhanced and would affect recovery outcomes or to improve more significantly [11,12,13].

The findings also are consistent with rehabilitation theory and meet the standards set for clinical frameworks to support patient recovery in different settings. In terms of theoretical implications, this study strongly supports the integrated rehabilitation model and provides evidence for the development and refinement of rehabilitation strategies [14,15]. The results obviously provide evidence to practitioners by demonstrating and confirming that patients will learn recovery strategies better and gain practical experience when they apply them in real rehabilitation contexts. All of the constructs of the model except 'cost efficiency' explained the outcomes, thus explaining more than 80% of the variance in the model.

The study showed that with adherence as a predictor, the relationship between accessibility and functional recovery for explanatory purposes was significant. The full model accounted for 87.6% of the variance for functional recovery. More focus on patients' rehabilitation support systems should be implemented with the objective of assisting patients in their early stages of recovery.

Continuous monitoring is one effective way for patients to have positive experiences about their recovery as the support would encourage them to participate, adapt, and also feel confident about themselves and thus, finish the rehabilitation program. This was different from the previous studies, where rehabilitation was limited only to hospital-based group learning environments.

To date, similar approaches involving home-based rehabilitation is still limited and is mainly conducted by specialized institutions, such as, the rehabilitation centers.

Findings were also in agreement with previous researchers who found that patients involved in the rehabilitation process, whose treatment approaches used structured programs in the recovery setting, reported high levels of satisfaction outcomes [11,12,13]. This finding is in line with earlier studies, who proved that significant rehabilitation needs were found for all dimensions of the model, and others who supported the role of accessibility in the improvement of recovery outcomes.

This might have been caused by the inclusion of an additional variable selection bias to act as a correction factor which was incorporated in this study. However, some of the participants considered this kind of rehabilitation approach took too much time and that they had difficulty managing learning activities [15,16]. Although only a small number experienced this, the issue could be understood especially among those patients who were not familiar with presenting using the structured rehabilitation format.

However, further studies should be carried out across different settings to obtain more evidence for its effectiveness. This study was only carried out in the context of Uzbekistan, and further research must be done in other regions around the world. For example, it mainly relied on survey data and did not include other methods of measurement which made it difficult to accurately estimate the effect of any unobserved variables. It is recommended that a longitudinal study be carried out for more comprehensive findings. For example, it mainly relied on survey data and did not include other methods of measurement which made it difficult to fully estimate the effect of any external factors.

## CONCLUSION AND RECOMMENDATIONS

The findings provide further support for the integrated rehabilitation framework that postoperative patients' development of functional recovery skills may vary across different rehabilitation settings or may develop



unevenly across treatment phases. Although it is practical, in the context of clinical rehabilitation programs, to use models that combine several rehabilitation dimensions, it is important to ensure that the constructs work effectively together, and therefore will provide consistent outcome measures, especially when there is clear evidence of uneven development in the different dimensions of recovery. In line with the assumptions of the structural equation model (SEM) and the Heckman selection model, the findings of this study suggest that patients who actively adhere to rehabilitation programs will be able to achieve a higher level of functional recovery, improve patient satisfaction and help produce better outcomes for the healthcare system.

The mixed-method approach, for example, can provide more reliable, comprehensive data that can validate the findings from the quantitative analysis and hence determine their robustness and consistency. However, the approach, to some extent, caused certain measurement limitations to be observed and this was its main methodological constraint. Such studies would investigate whether patients also note similar patterns as their rehabilitation experiences evolve. Alternatively, since patients' response also suggested that the structured program enables them to understand and manage their recovery of the rehabilitation process, future research on this topic should to further examine the effectiveness of the rehabilitation strategies in increasing patients' long-term recovery outcomes. Future studies may expand the number of participants in order to yield more diverse and representative data and thus better explain the rehabilitation outcomes in the context of postoperative care in Uzbekistan.

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## IQTISODIYOT & TARAQQIYOT

*Ijtimoiy, iqtisodiy, texnologik, ilmiy, ommabop jurnal*

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