

A Systematic Review on the Results of the Coordinator Approach in Transcatheter Aortic Valve Implantation

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ABSTRACT

Purpose: Communication and coordination between the patient, family, and heart team members remain a managerial challenge, although the heart team approach considers the Transcatheter Aortic Valve Implantation (TAVI) management multidimensional. The managerial difficulties of the TAVI have been overcome by a coordinator, usually a nurse, who is called the TAVI coordinator. This systematic review aims to holistically reveal the results of the coordination approach in TAVI management.

Methods: With the search designed based on study purpose in databases, 445 studies were identified [Science Direct (n=259), Scopus (n=62), Google Scholar (n=43), Medline+TR Index (n=13), PubMed (n=12), Web of Science (n=10), Emerald (n=4), Citations (n=42)]. Twenty-eight (28) studies were synthesized after systematic screening based on study criteria. The systematic review process used a systematic search and review typology. The research process was implemented based on the "PRISMA" checklist.

Results: Results indicated that TAVI or valve structural heart coordination accelerates the pathway, increases patient satisfaction, optimizes resource use, and reduces costs, helping to prevent medical error.

Conclusion: This study reveals the positive results of the coordination approach on the team, patient and hospital. It can bring the approach to the agenda of clinic and hospital managers as a managerial tool.

Keywords: Transcatheter aortic valve replacement, Hospital administration, Patient care team

ÖZET

Amaç: Kalp takımı yaklaşımı Transkateter Aort Kapak İmplantasyonu (TAVI) yönetimini çok boyutlu olarak ele alsa da hasta, aile ve kalp takımı üyeleri arasındaki iletişim ve koordinasyon, yönetsel bir zorluk olmaya devam etmektedir. TAVI'nin yönetsel zorlukları, TAVI koordinatörü olarak adlandırılan, genellikle hemşire olan bir koordinatör tarafından aşılmaktadır. Bu sistematik derleme, TAVI yönetiminde koordinasyon yaklaşımının sonuçlarını bütünsel olarak ortaya koymayı amaçlamaktadır.

Yöntem: Veri tabanlarında [Science Direct (n=259), Scopus (n=62), Google Scholar (n=43), Medline+TR Dizin (n=13), PubMed (n=12), Web of Science (n=10), Emerald (n=4), Citations (n=42)] çalışma amacına uygun olarak tasarlanan tarama sonucunda 445 çalışma belirlenmiştir. Çalışma kriterlerine dayalı sistematik taramanın ardından yirmi sekiz (28) çalışma sentezlenmiştir. Sistematik inceleme sürecinde sistematik bir arama ve inceleme tipolojisi kullanılmıştır. Araştırma süreci "PRISMA" kontrol listesi esas alınarak uygulanmıştır.

Bulgular: Sonuçlar, TAVI, kapak veya yapısal kalp koordinasyonunun hasta süreçlerini hızlandığını, hasta memnuniyetini artırdığını, kaynak kullanımını optimize ettiğini, maliyetleri düşürdüğünü ve tıbbi hataların önlenmesine yardımcı olduğunu göstermektedir.

Sonuç: Bu çalışma, koordinasyon yaklaşımının kalp takımı, hasta ve hastane üzerindeki olumlu sonuçlarını ortaya koymaktadır. Bu çalışma koordinasyon yaklaşımını bir yönetim aracı olarak klinik ve hastane yöneticilerinin gündemine getirebilir.

Anahtar Kelimeler: Transkateter aort kapak değişimi, Hastane yönetimi, Hasta bakım ekibi

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The access and scope of health services have been increasing with the development of technology. One of these areas is aortic stenosis (AS) treatment, which has a very high prevalence in the elderly population and is fatal. The surgical approach in treating AS was dominant in the past, but now, this treatment can be performed invasively with recent technologies. Transcatheter Aortic Valve Implantation (TAVI) is an invasive treatment method used successfully in treating AS.

TAVI is an invasive treatment process that requires a multidisciplinary team and many logistic factors (1, 2). In addition, considering that AS patients who undergo TAVI intervention are mostly over the age of 65–85 and have accompanying geriatric diseases, the fragility levels of these patients are also high. These issues make TAVI management more complex.

The TAVI in treating AS has been increasing over time, and the population age for which TAVI has been applied is gradually decreasing. The management processes of this treatment also evolved with the development of TAVI. A multidisciplinary heart team management was introduced to conduct the complex structure of the TAVI effectively and safely. The heart team includes a cardiologist, cardiovascular surgeon, radiologist, anesthesiologist, anesthesia technician, nurse, radiology technician, and clinical support staff. Depending on the patient's comorbidities, additional specialties might be included in the heart team. Although the heart team approach considers the TAVI management process multidimensional, communication and coordination between the patient, family, and heart team members remain a managerial challenge. The managerial difficulties of the TAVI have been overcome by a coordinator, usually a nurse, who is called the TAVI coordinator. However, the name of the TAVI coordinator varies in the literature (TAVI, TAVR, Valve, or Structural Heart Coordinator), whose primary duties and responsibilities are quite similar (3, 4). The primary purpose of the TAVI coordinator is to ensure effective coordination of the multi-stage TAVI treatment process, which requires a multidisciplinary team, from patient selection, logistics, human resources to communication during, pre, post-procedure and follow-up treatments, without deficiencies and interruptions (5). The TAVI has been managed to be safer, more effective, and more efficient with the TAVI coordination approach in many countries in Europe (6-10) and the United States of America (USA) (4, 5, 11-13). There are systematic review studies on the TAVI process and its medical outcomes. However, there is no systematic review study regarding

the coordinator approach in TAVI process management in the literature. This systematic review aims to holistically reveal the results of the coordination approach in TAVI management. In this context, the following research questions were posed:

1. What is the distribution of studies on TAVI coordination by years and countries?
2. What are the methodological approaches used in the studies conducted on TAVI coordination?
3. What are the literature findings regarding the health outcomes of the TAVI coordination approach?
4. What are the literature findings concerning the managerial result of the TAVI coordination approach?

2. Material Method

Research Method: This study used a systematic review methodology to examine studies on the coordinator approach in managing TAVI. The systematic review process used a systematic search and review typology. The research process was implemented based on the "PRISMA" checklist developed by Page and McKenzie (14).

Search Strategy: In order to find studies suitable for the research purposes, all types of studies were obtained with the search criterion of ["Transcatheter Aortic Valve Implantation" or "Transcatheter Aortic Valve Replacement" or "TAVI" or "TAVR" or "VALVE" or "STRUCTURAL HEART" and "COORDINATOR" in "all field"]. The database search was conducted between December 1-15, 2023.

Inclusion and Exclusion Criteria: Criteria for inclusion in the study were as follows: the studies were determined to be conducted in the field of health services, to present findings, results, ideas, or comments regarding the coordination management approach in structural heart diseases, especially TAVI, and to be written in English. Exclusion criteria were as follows: studies were out of healthcare and unrelated to the research topic, unable to access the full text, and not presenting findings, results, ideas, or comments regarding the management process of structural heart diseases and TAVI in healthcare.

Including Studies: In databases search, 445 studies were identified [Science Direct (n=259), Scopus (n=62), Google Scholar (n=43), Medline+TR Index (n=13), PubMed (n=12), Web of Science (n=10), Emerald (n=4), Citations (n=42)].

The databases were selected based on their relevance and scope in medical and healthcare research. ScienceDirect, Scopus, PubMed, and Web of Science were chosen for their coverage of peer reviewed. Google Scholar was included to ensure a broader search scope. Medline+TR Index was selected to incorporate relevant Turkish medical studies, while Emerald focused on health management and policy-related research. Citation tracking was used to identify additional relevant studies. The systematic screening process for the studies identified through the research strategy is illustrated in Figure 1. In the duplicate analysis, 39 studies identified by the EndNote software ($n = 30$) and the researchers ($n = 9$) were excluded. The remaining 406 studies were evaluated in terms of study name and abstract, and 332 studies unrelated to the study purpose were excluded. The remaining 74 studies were included in the full-text quality assessment. A total of 53 studies were

excluded, the full text of which could not be accessed ($n = 5$), and studies unrelated to the study purpose ($n = 48$). During the full-text quality control process of the studies, citation scanning was performed, and five studies were included in the remaining 23 studies in the scope of the research. After the systematic search, 28 studies were synthesized.

Synthesis and Presentation of the Findings: A narrative and tabular approach was used to synthesize and present the findings of previous studies.

Limitation of Study: The study findings are limited to the English language publications found in the databases as a result of the search. Moreover, since the randomized controlled study on the research topic was limited, the findings of all study types were evaluated.

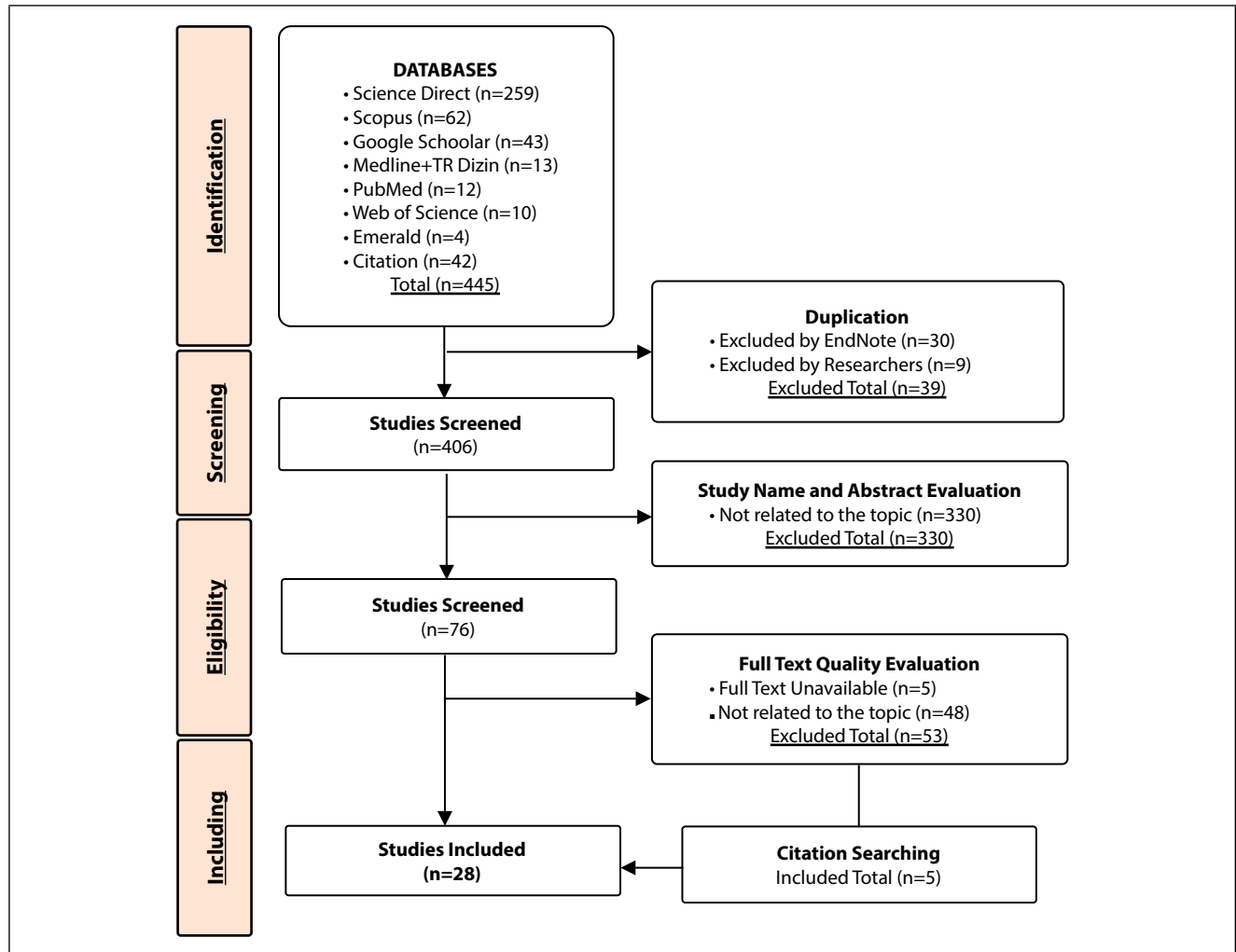


Figure 1: Systematic Screening of Studies on the TAVI Coordinator Approach (Created in MS Word 365)

3. Results

The studies (n=28) of the TAVI coordinator approach within this research purpose were published between 2011 and 2023. 2019 (n=6) and 2022 (n=6) were the years in which the most frequent studies on TAVI coordinators were published. No studies regarding TAVI coordinators were published in 2015 and 2017. The key characteristics of the included studies are summarized in Table 1. Considering the country distribution of the studies on TAVI coordinators, all were published in countries with developed health systems. The USA (57.14%, n=16) and Canada (17.86%, n=5) were the countries with the most frequent studies on TAVI coordinators. Regarding

methodology, 42.84% (n=12) of the studies were based on literature and interpretation. Only 7.14% (n=2) of the studies within the scope of the research were intervention-control studies. Furthermore, 10.7% of the studies were TAVI pathway designs with the TAVI coordinator approach. The remaining studies were descriptive, qualitative, report, core curriculum, and retrospective archive screening. The 28 studies included in this review varied in sample size, selection criteria, and homogeneity. Sample sizes ranged from small qualitative cohorts to large prospective studies. While some studies included homogenous groups, such as TAVI patients, others examined broader populations with structural heart diseases (Table 2).

Table 1. Characteristics of Studies

Characteristics		n	%
Country	USA	16	57,14
	Canada	5	17,86
	Germany	2	7,14
	Australia	2	7,14
	Holland	2	7,14
	France	1	3,57
Study Types & Research Methodology	Book Section	4	14,29
	Review	3	10,71
	Idea, statement, editorial	6	21,43
	Prospective Case Follow-up	3	10,71
	Prospective Program Development	3	10,71
	Intervention-Control Study	2	7,14
	Descriptive	2	7,14
	Panel	1	3,57
	Qualitative	1	3,57
	Report	1	3,57
	Core Curriculum	1	3,57
	Retrospective Archive Screening	1	3,57
Total		28	100

The research results regarding the coordination approach in TAVI can be evaluated under two headings: patient outcomes and administrative outcomes. The TAVI coordinator approach does not have a negative impact on patient outcomes and is qualified as safe (7, 15). No other studies regarding direct patient outcomes have been found in the literature. When the managerial results are

examined, publications show that the approach increases communication between all stakeholders in the TAVI process (7, 16), reduces long waiting times (9, 17), and helps efficient resource use (18, 19). The TAVI coordinator approach was also mentioned to have the potential to prevent medical errors (20). Summary findings for the studies included in the research are elaborated in Table 2.

Table 2. Summary Findings of Studies

No	Study	Aim	Place	Method	Sample	Conclusion
1	(Batchelor et al., 2023, pp. 3-10)	To evaluate the development of a multidisciplinary cardiovascular team and the challenges	USA	Expert Panel	-	The coordinator is an important component of the multidisciplinary heart team. The lack of a heart team approach in centers with low patient volume has been revealed as a limitation (13).
2	(Adhami et al., 2023, p. 464)	To evaluate patients' experiences and perspectives on early recovery during transcatheter intervention processes	TAVI Clinic, British Columbia, Canada	A Prospective Qualitative Study	12 patients	The necessity of a valve coordinator nurse in transcatheter intervention processes has been demonstrated. As the primary point of contact for open communication, the valve coordinator nurse is important during the long waiting periods of TAVI patients (16).
3	(Lauck & Smith, 2022, p. 70)	To provide a guide for cardiovascular nurses and allied health professionals in heart valve diseases.	USA	Book (24)	-	Patients benefit from the coordination management practice applied in the management of structural heart diseases, and it is effective (12).
4	(Clarke, 2022, p. 90)					The coordinator plays a pivotal role in the management of the diagnostic and follow-up processes of structural heart diseases and can contribute to the prevention of medical errors (20).
5	(Frantzen et al., 2022, p. 127)					Because TAVI patients also have geriatric problems, coordinator practice is essential in TAVI process management (25).
6	(Speight, 2022, p. 169)					The challenging but most important duties of TAVI coordinators are leading the TAVI team and ensuring effective communication (28).
7	(Bohmann et al., 2022, pp.13-15)	To investigate the impact of the TAVI Coordinator Program	3 TAVI Centers GERMANY	A Prospective Intervention-Control Study	(81 intervention, 84 control TAVI patients)	TAVI coordinator programs can improve the TAVI process, including pre-and post-TAVI care and patient satisfaction, without compromising safety (7).
8	(Lauck et al., 2022, p. 221)	To present best practice examples in TAVI programs.	Vancouver, British Columbia, Canada	Statement	-	The TAVI coordinator practice is an example of an effective best method. TAVI coordination is an important administrative element for effective communication during the treatment process. Nurses play an important role in shortening discharge times (11).
9	(Bennetts et al., 2021, pp. 1813-1814)	To set minimum standards for TAVI center accreditation in Australia	AUSTRALIA	Statement	-	In centers that perform 30 TAVIs annually, the TAVI coordinator is included in the accreditation criteria as the main member of the heart team (6).
10	(Lortz et al., 2021, p. 324)	To evaluate the effect of the TAVI coordinator system on hospital stay times in TAVI interventions.	West German Heart Center, Germany	Intervention-Control Study	409 TAVI patients (2014-2017)	TAVI coordinator practice can shorten hospital stays (9).
11	(Perpetua & Russo, 2021, p. 605)	To reveal the experiences gained from transcatheter structural heart disease processes	USA	Editorial	-	Triage by coordinators is important in the process of structural heart disease and resource use (18).
12	(Elizabeth M. Perpetua et al., 2021, p. 173)	To make recommendations to optimize the care process in the structural heart program	USA	Review	-	There is a coordinator nurse role in recommendations for the coordination of the structural heart disease process (30).
13	(De Ronde-Tillmans et al., 2020, p. 40)	Establish and evaluate the Rotterdam TAVI care and treatment program.	HOLLAND	Program Desing	Single-center program design	The TAVI coordinator is one of the important elements of the project and coordinates the entire TAVI process (pre-, operation and post) (8).
14	(Lauck et al., 2020, p. 538)	Making recommendations for the TAVI program during COVID-19	CANADA	Statement	-	The COVID-19 period proved the necessity of a nurse-led coordination system in TAVI management (26).
15	(Van Wiechen et al., 2020, p. 286)	Recommending a lean TAVI management process at all stages, from patient selection to post-procedure	HOLLAND	Statement	-	The coordinator plays a vital role in the lean TAVI management and early discharge of patients (10).
16	(Straiton et al., 2020, p. 5409)	Examining the role of the coordinator in structural heart disease management	AUSTRALIA	Descriptive Study	18 public hospitals	A structural heart coordinator existed in 10 of 18 public hospitals. They were mostly responsible for coordinating many structural heart diseases such as TAVI, MitraClip, and LAA (29).
17	(Lauck S. et al., 2019, p. 5204)	Demonstrating the effectiveness and reliability of nurse-led 3M TAVR management	Vancouver, CANADA	Prospective Case Follow-up	411 patients	The nurse-coordinated 3M (Multidisciplinary, Multimodal, Minimalist) TAVR program is a safe and effective strategy to facilitate discharge after the procedure (15).

Table 2. Summary Findings of Studies

No	Study	Aim	Place	Method	Sample	Conclusion
18	(Johnson, 2019, pp. 18-19).	Revealing the development process of the structural cardiac coordinator system	USA	Statement	-	TAVI coordination has evolved from the valve implantation process to the coordination of all structural heart diseases. In particular, in centers with high patient volumes, the coordination system is an important managerial tool (4).
19	(Neuburger et al., 2019, p. 1737)	To present operational and institutional recommendations and requirements for the TAVI management process.	USA	Review	-	During the TAVI management process, a full-time TAVI coordinator should be assigned to the multidisciplinary heart team (23).
20	(Perpetua et al., 2021, pp. 173-175).	To reveal the role of the coordinator in the structural heart diseases multidisciplinary heart team	USA	Descriptive Study	219 Structural heart coordinators	By profession, the TAVI coordinator is a member of the multidisciplinary heart team. In this study, the characteristics and duties of the coordinator were revealed (22).
21	(Tchetché et al., 2019, pp. 30-31)	To enhance the effectiveness of the TAVI management process, recommendations for improvement	FRANCE	Review	-	Using the coordination system in the TAVI management process can reduce costs and save time for physicians. The TAVI preparation process managed by the coordinator can make it easier for the heart team to select appropriate patients (21).
22	(Wood et al., 2019, p.467)	To evaluate the effectiveness and safety of next-day discharge using the Vancouver 3M TAVI management process.	CANADA, AMERICA	Prospective Case Follow-up	6 centers, 1400 patients	When medium- and high-volume centers use the Vancouver 3M TAVI management process (with a TAVI coordinator), their patients can be discharged safely the next day with effective results (19)
23	(Almanfi, 2018, pp. 197-198)	To lay out the essential elements for starting a structural heart program	Indiana, USA	Report	-	The heart coordinator is one of the most important elements of the structural heart program. In addition to controlling all pre- and post-procedure processes, it plays a crucial role in effective communication with the patient and his family. In hospitals with high TAVI volumes, data recording and follow-up should be provided to other personnel, and the heart coordinator should focus only on patient follow-up and care processes (27).
24	(Lauck et al., 2016, p. 320).	To present the development, implementation, and evaluation of a standardized clinical process to ensure safe and prompt discharge from TAVI interventions.	Vancouver, CANADA	Prospective Case Follow-up	397 TAVI patients (May 2012-September 2014)	The Vancouver TAVI program, with a TAVI coordinator on the heart team, can shorten hospital stays (17).
25	(Hawkey et al., 2014, pp.859-860)	To summarize best practice recommendations from centers with extensive experience in program development.	USA	Core Curriculum	-	TAVI has caused a significant paradigm shift in structural heart disease process management. The success of TAVI process management is based on effective coordination and communication (3).
26	(Lauck et al., 2013, pp. 35-36)	Establish effective care processes to support transcatheter aortic valve replacement programs.	USA	Program Design	-	The TAVI coordinator is a vital component in the TAVI management process, ensuring coordination among healthcare professionals, the family, and the patient. Education of the patient and family is also the responsibility of the TAVI coordinator. It should be implemented under the guidance of the coordinator, from patient selection to triage and geriatric follow-up (5).
27	(Bakaeen et al., 2012, p. 664).	Establish the TAVI program in the US Military Health System.	USA	Project	16 Veterans' Integrated Service Networks	The TAVI coordinator system was included in the TAVI program established in the US Military Health System (2).
28	(Bavaria et al., 2011, p. 2073)	To examine management strategies in the referral process of TAVI patients in a hospital	Heart Center, USA	Retrospective Archival Research	681 TAVI patients 2007-2010	The necessity of a cardiac team in the decision and follow-up processes of patients with TAVI has been demonstrated (Bavaria et al., 2011, p. 2075). The processes in a new existing clinic are followed by the TAVI coordinator nurse (1).

4. Discussions

The TAVI application was initially managed only with the heart team concept. However, coordination among the heart team members, patients, and families emerges as a managerial challenge. Therefore, one of the essential components of the heart team is the coordinator. In this context, Bavaria and Szeto (1) have emphasized the necessity of the heart team in the management of the TAVI process. They started the TAVI coordinator practice in one unit where the study was conducted. Due to the increasing number of TAVI cases, TAVI programs with TAVI coordinators have been implemented in US military hospitals (2) and other hospitals (5, 8). It can be stated that with the increase in the number of TAVIs, the TAVI coordinator system also become widespread.

Evaluated studies mainly indicated that the TAVI coordinator should manage the TAVI pathway (8, 10, 11, 13, 16, 21-25). In fact, in Australia, the TAVI coordinator approach is considered one of the requirements of the accreditation process (6). Luck et al. (26) stated in their study that the COVID-19 process, in which healthcare systems were challenged, once again demonstrated the necessity of the TAVI coordinator approach.

Luck et al. (5) highlighted that the TAVI coordinator was a crucial component in terms of communication between health professionals, families, and patients. The study also revealed that the TAVI coordinator should be responsible for educating patients and their families. Another study finding is that the TAVI coordinator should manage the entire TAVI pathway, from patient triage to follow-up examinations. Similarly, Hawkey et al. (3) also touched upon the importance of the TAVI coordinator in their study, emphasizing that the most significant elements in the TAVI process were communication and coordination. Almanfi (27) also revealed similar findings in his report and even stated that TAVI data management should be given to other personnel so that the TAVI coordinator can focus only on the patient process.

In the Vancouver cohort study in 2016, 397 patients with TAVI were followed under the management of the TAVI coordinator, and this management approach was stated to shorten patient hospital stays (17). Similar results were obtained in the Vancouver study in 2019 (15). In addition, another Vancouver study published jointly by the USA and Canada revealed that patients could be safely discharged the next day in cases performed under the TAVI coordinator

(19). Another Vancouver study in 2022 supports the findings (11). In their study, Van Wiechen et al. (10) mentioned that the coordinator influenced the early discharge process of TAVI patients. In their intervention and control study, Lortz et al. (9) demonstrated that the TAVI coordinator approach could shorten patient hospitalization duration, supporting the findings of the Vancouver studies. Similarly, Adhami et al. (16) stated that the TAVI coordination approach and the heart team were critical components in preventing long patient waiting times.

The TAVI coordinator approach was recommended in high-volume units (4, 13, 19). Bennetts et al. (6) expressed this situation more clearly and remarked that centers that perform more than 30 TAVI cases annually should switch to a TAVI coordinator program.

In addition, studies have indicated that the TAVI coordinator is an important factor in communication between health professionals, the patient, and the family (3, 11, 16, 27, 28).

Clarke (20) proposed that the coordinator in TAVI process management could contribute to the prevention of medical errors. Supporting this idea, in the intervention-control study, the TAVI coordinator program improved the pathway and did not negatively affect patient safety (7). Likewise, in the Vancouver study, the nurse-coordinated TAVI program was a safe and effective strategy (15, 19).

Studies have revealed the positive results of the TAVI coordination system on resource use. Perpetua and Russo (18) stated that patient triage performed by coordinators could positively affect resource utilization. Additionally, Tchetché et al. (21) indicated that TAVI programs managed by coordinators could reduce costs and save physicians more time.

In the intervention-control study, the TAVI coordinator system increased patient satisfaction (7). Similarly, another study reported that patients benefited from the TAVI coordinator management approach (12).

The TAVI coordinator approach evolved in many procedures in the cath lab over time. Left Atrial Appendage Closure (LAA), Mitra Clip, etc., cases requiring similar managerial requirements of TAVI and a multidisciplinary approach were managed with the same approach (4, 29). Therefore, the concept of TAVI coordinator is also called Valve or Structural Heart Coordinator.

5. Conclusions

The preliminary study presents systematically and holistically the literature findings of the coordination approach in TAVI management. Evaluating the studies on TAVI coordinators, this management approach is necessary in the catheter laboratory. Results indicated that TAVI or valve structural heart coordination accelerates the pathway, increases patient satisfaction, optimizes resource use, and reduces costs. This study reveals the positive results of the coordination approach on the team, patient, and hospital. The findings bring the approach to the agenda of clinic and hospital managers as a managerial tool. Even though there are promising results in the literature on the TAVI coordination management approach, further studies are needed, considering that a significant part of the studies are literature reviews and descriptive studies.

Although the literature demonstrates promising results regarding TAVI coordination management, significant gaps remain. Future research should prioritize:

- Conducting large-scale, multicenter randomized controlled trials to evaluate the direct effects of TAVI coordination on clinical outcomes, patient satisfaction, and cost-efficiency.
- Comparing TAVI coordination practices across different healthcare systems to identify best practices.
- Investigating the sustainability of outcomes, such as patient quality of life and readmission rates, in hospitals with established TAVI coordination systems.
- Assessing the impact of standardized training programs for TAVI coordinators on patient and system-level outcomes.

By focusing on these areas, researchers can better understand the coordination approach in TAVI management.

6. Declarations

Funding

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Conflict of interest

No conflict between the authors.

Availability of Data and Material

This study's scanned and synthesized publications are available upon request.

Authors' Contributions

Desing: UU, Collected Data: UU, YA, Analysis Data: UU, YA, Wrote Paper: UU, YA, Supervision: YA.

Ethics Committee Permission

Since the study was conducted based on the literature databases, ethics committee permission was not required. This study was conducted within the principles of the Declaration of Helsinki.

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