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Emergency Valve Intervention in Decompensated Severe Aortic Stenosis: Urgent Transcatheter Aortic Valve Implantation and Balloon Valvuloplasty

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Mohamed Abdelazim [1], Mohamed Elbouhi [2, 1], Hamza Murad [3], Mohamed Elgamal [4], Abdulrahman Mahmoud Abdelhady Bayomi [5], Mhd Anas Murad [6], Ahmed Abdullah [7], Mohammed R. Mohsen [8]

1. Cardiology, Royal Cornwall Hospitals NHS Trust, Truro, GBR 2. Cardiology, Al-Azhar University, Cairo, EGY 3. Emergency Medicine, Royal Cornwall Hospitals NHS Trust, Truro, GBR 4. Trauma and Orthopaedics, Royal Cornwall Hospitals NHS Trust, Truro, GBR 5. General Medicine, Royal Cornwall Hospitals NHS Trust, Truro, GBR 6. General Surgery, Royal Cornwall Hospitals NHS Trust, Truro, GBR 7. Family and Community Medicine, Royal Cornwall Hospitals NHS Trust, Truro, GBR 8. Acute Medicine, Royal Cornwall Hospitals NHS Trust, Truro, GBR

Corresponding author: Hamza Murad, hamzeh.murad@nhs.net

Abstract

Severe aortic stenosis frequently first comes to medical attention, or abruptly worsens, as acute decompensation: pulmonary oedema, refractory heart failure or cardiogenic shock. Many of these patients are already known to have significant stenosis and are waiting for valve replacement. Medical therapy has little to offer in this setting, and the two practical interventional options are urgent or emergent transcatheter aortic valve implantation (TAVI) and balloon aortic valvuloplasty (BAV), used either as a definitive rescue or as a bridge to later valve replacement. This narrative review summarises the observational evidence on both strategies. Across registries and single-centre series, urgent TAVI accounts for roughly 5-10% of TAVI procedures and achieves device success comparable to elective TAVI. However, it is associated with more acute kidney injury and higher early mortality, although the size of the mortality difference varies between studies and several did not find a significant difference after adjustment; the excess risk appears to be concentrated early after the procedure. Within the urgent population, shorter time from admission to TAVI has been associated with better mid-term outcomes in observational studies. BAV can stabilise patients rapidly and remains useful when TAVI is unavailable or the patient is too unstable, but it is a temporary measure that the 2025 European guidelines reserve for carefully selected patients, and comparative series report higher mortality with a BAV-first strategy than with direct TAVI. All of these comparisons are confounded by patient selection. The available data support direct TAVI where feasible, BAV as a rescue or bridge, attention to renal protection and close follow-up after discharge. Above all, they support faster elective pathways that prevent decompensation in the first place. Randomised data and standardised definitions are needed.

Categories: Cardiology, Emergency Medicine, Cardiac/Thoracic/Vascular Surgery
Keywords: acute heart failure, aortic stenosis, balloon aortic valvuloplasty, cardiogenic shock, transcatheter aortic valve implantation, urgent tavi

Introduction And Background

Calcific aortic stenosis is the most common primary valve lesion requiring intervention in older adults in Europe and North America, and its burden is rising as populations age [1]. Once stenosis is severe and symptoms appear, the outlook without valve replacement is poor. European and North American guidelines recommend aortic valve replacement, by transcatheter or surgical means, for patients with symptomatic severe disease [1,2].

A substantial proportion of patients do not reach valve replacement through a planned, elective pathway. Instead, they present acutely with new or rapidly worsening breathlessness, pulmonary oedema, syncope or haemodynamic collapse. This presentation is often termed acute decompensated aortic stenosis [3]. The fixed outflow obstruction leaves little room for conventional heart-failure therapy. Vasodilators can provoke hypotension, and inotropes and diuretics provide only temporary relief while the valve remains untreated [3]. Importantly, decompensation is frequently not the first sign of disease. In one large single-centre series, more than half of the patients presenting with acute decompensation were already known to have significant aortic stenosis before admission [4]. This finding highlights the vulnerability of patients waiting for intervention.

When decompensation occurs, clinicians must choose between performing transcatheter aortic valve implantation (TAVI) urgently during the same admission, relieving the obstruction temporarily with balloon aortic valvuloplasty (BAV) and deferring definitive replacement, or continuing medical stabilisation. Urgent

surgical aortic valve replacement makes up only a small share of procedures in this setting and is associated with worse outcomes than elective surgery [3]. Randomised evidence to guide the choice is lacking. This narrative review summarises the observational and meta-analytic evidence on urgent TAVI and emergency BAV in decompensated severe aortic stenosis. It also discusses the practical implications for patients who deteriorate while awaiting valve replacement.

Review

Literature search

This is a narrative, non-systematic review. PubMed/MEDLINE and Europe PMC were searched on 29 October 2026 for English-language articles published from January 2008 to October 2026. The search combined terms for aortic stenosis ("aortic valve stenosis" [MeSH], "aortic stenosis"), for acute presentation ("urgent", "emergent", "emergency", "acute heart failure", "decompensated", "cardiogenic shock") and for intervention ("transcatheter aortic valve", "TAVI", "TAVR", "balloon aortic valvuloplasty"). The searches returned 808 records in PubMed and 445 in Europe PMC, with substantial overlap. Titles and abstracts were reviewed to identify comparative cohort studies, national registries and meta-analyses, and the reference lists of these articles and of current guidelines were also examined. Fifteen studies were selected for detailed discussion: 11 primary cohort studies or registry analyses and four meta-analyses. Two guidelines, one narrative review, one editorial and one case report are cited for context. Screening and selection were performed by two authors and were not duplicated. No formal screening protocol, risk-of-bias assessment or quantitative pooling was used, and the findings are synthesised descriptively.

Definitions and frequency of urgent intervention

There is no single definition of urgent or emergent TAVI, and this heterogeneity complicates comparison between studies. Some registries apply the Society of Thoracic Surgeons procedural-status categories [5]. Others define emergency TAVI as any unscheduled procedure for refractory heart failure or cardiogenic shock [6] or restrict urgent TAVI to patients admitted with persistent heart failure despite medical therapy who underwent TAVI during the same admission [7]. Studies of emergency BAV generally require cardiogenic shock with catecholamine support, New York Heart Association class IV dyspnoea, resuscitation or mechanical respiratory support [8]. Studies have also defined timing thresholds within the urgent group differently, for example, TAVI within 60 hours of emergency department arrival [9] or BAV within a few hours of admission (discussed below).

Despite these differences, the reported frequency of non-elective TAVI is consistent. It made up 5.2% of procedures in a US integrated health system [5], 6.6% in an Israeli single-centre registry [7], about 9% in a large US single-centre cohort [9], 9.9% in the Society of Thoracic Surgeons/American College of Cardiology Transcatheter Valve Therapy (STS/ACC TVT) Registry [10] and 9% in an Australian two-centre cohort [11]. A higher figure of 19% was reported from a UK centre with an established acute pathway [4]. Compared with elective patients, those treated urgently more often have heart failure, reduced left ventricular ejection fraction, chronic kidney disease, prior valvuloplasty and higher surgical risk scores [5,9,10]. In a contemporary lower-risk Australian cohort, urgent patients were younger, more often lived in regional or socioeconomically disadvantaged areas and had more severe stenosis and cardiac remodelling. This pattern suggests that delayed access to care, and not only biology, contributes to acute presentation [11].

What the guidelines say

The 2025 European Society of Cardiology/European Association for Cardio-Thoracic Surgery (ESC/EACTS) guidelines, which replace the 2021 version, address this situation directly. They note that admission with acute decompensated aortic stenosis is common, although only a small minority of these patients present in cardiogenic shock. BAV was used in this setting in the past, but the guidelines state that TAVI has largely replaced it in recent years because of the high risk of severe aortic regurgitation and death with BAV in the acute setting. They also state that several large observational studies have established the feasibility of TAVI in cardiogenic shock, with device success similar to that of routine TAVI but higher 30-day mortality. BAV is now described as something that may be rarely considered as a bridge to TAVI or surgical aortic valve replacement in carefully selected patients with decompensated aortic stenosis or in those with severe aortic stenosis who require urgent high-risk non-cardiac surgery, because the procedure carries significant risks of acute complications [1]. The 2020 American College of Cardiology/American Heart Association guideline makes no formal recommendation on BAV in adults. Its supporting text describes the role of balloon dilation in older patients as very limited and states that it is not a substitute for valve replacement. It also notes that some clinicians regard BAV as a temporary bridge to TAVI or surgery in patients with severe aortic stenosis and refractory pulmonary oedema or cardiogenic shock [2]. Neither guideline specifies how quickly TAVI should be performed during an unplanned admission, and the European position on TAVI in shock rests on observational data. These decisions therefore rest largely on the evidence reviewed below.

Outcomes of urgent TAVI compared with elective TAVI

The principal comparative studies are summarised in Table *1*. A consistent finding is that the procedure itself can be performed successfully in the urgent setting. In the STS/ACC TVT Registry, device success was

92.6% after urgent or emergent TAVI and 93.7% after elective TAVI. The difference was statistically significant but of little clinical importance [10]. Implantation success reached 96.3% in the Israeli series [7], procedural mortality did not differ significantly between acute and elective patients in the UK cohort (1.2% vs 0.7%) [4], and procedural success, device-related complications and post-implantation valve function were similar in the Australian cohort [11].

Study	Total patients, n	Urgent, % of total	Outcome (unit)	Urgent group	Elective group	Effect estimate (95% CI)	P-value
Kolte et al., 2018 [10]	40,042	9.9	Device success (%)	92.6	93.7	NR	0.007
			AKI or new dialysis (%)	8.2	4.2	NR	<0.001
			30-day mortality (%)	8.7	4.3	aHR 1.28 (1.10-1.48)	NR
			1-year mortality (%)	29.1	17.5	aHR 1.20 (1.10-1.31)	NR
Patel et al., 2020 [4]	893	19	Procedural mortality (%)	1.2	0.7	NR	0.62
			30-day mortality (%)	5.3	1.1	NR	0.002
			Length of stay (mean, days)	31.9	6.1	NR	<0.001
Kaewkes et al., 2021 [9]	1,547	9	30-day mortality, adjusted (%)	8	2	NR	0.002
			2-year mortality, adjusted (%)	33	18	NR	0.002
Slade et al., 2023 [5]	1,564	5.2	All-cause death at 30 days (rate per 100 person-years)	2.3	0.7	aHR 1.92 (0.29-12.59)	0.50
			All-cause death at 1 year (rate per 100 person-years)	10.7	3.6	aHR 1.76 (0.86-3.62)	0.12
			AKI within 1 year (rate per 100 person-years)	24.7	13.0	aHR 1.85 (1.04-3.29)	0.04
			No improvement in quality of life at 30 days (%)	16.7	8.1	aOR 6.92 (2.09-22.91)	<0.01
Zhou et al., 2025 [11]	1,414	9.0	AKI (%)	9.2	3.4	aOR 2.43 (1.17-5.05)	0.017
			30-day mortality (%)	2.9	0.8	aHR 2.56 (0.34-19.3)	0.36
			12-month mortality (%)	14.3	5.3	aHR 3.18 (1.06-9.54)	0.04
			Length of stay (median, days)	9	4	NR	<0.001

TABLE 1: Selected comparative studies of urgent or emergent versus elective TAVI

Event rates are unadjusted values as reported by each study. Where an effect estimate is given, the p-value refers to that estimate; otherwise, it refers to the unadjusted between-group comparison. Values for Slade et al. [5] and Zhou et al. [11] were taken from the full-text articles. Slade et al. [5] reported death and acute kidney injury as event rates per 100 person-years rather than as percentages, so these rows are not directly comparable with the percentages reported by other studies. The quality-of-life estimate for Slade et al. [5] appears under a hazard ratio heading in the source table, but the Methods state that logistic regression was used for this outcome, so it is shown as an adjusted odds ratio. The full-text estimates for acute kidney injury and quality of life (shown here) differ from those quoted in the abstract of Slade et al. [5] (2.11 and 4.87). Landes et al. [7] is discussed in the text but not tabulated because it reported few outcomes in numerical form. Values for Kolte et al. [10], Patel et al. [4] and Kaewkes et al. [9] are as reported in the published abstracts. The statistical tests and test statistics are not shown because they were not consistently reported.

TAVI: transcatheter aortic valve implantation; AKI: acute kidney injury; aHR: adjusted hazard ratio; aOR: adjusted odds ratio; CI: confidence interval; NR: not reported

Procedural complications other than renal injury also appear broadly similar. The TVT Registry found no meaningful difference in major or life-threatening bleeding, major vascular complications, myocardial infarction, stroke, new permanent pacemaker implantation or conversion to surgery [10], and the Australian cohort likewise found no difference in in-hospital bleeding, vascular complications, myocardial infarction,

stroke or pacemaker implantation [11]. In contrast, acute kidney injury is repeatedly more common after urgent TAVI. Its incidence was 8.2% vs 4.2% (including new dialysis) in the TVT Registry [10] and 9.2% vs 3.4% in the Australian cohort, where urgent status remained independently associated with kidney injury after adjustment (adjusted odds ratio 2.43) [11]. Urgent status was also associated with acute kidney injury within one year in the Californian cohort (adjusted hazard ratio 1.85) [5]. These patients often arrive with congestion, low cardiac output and pre-existing renal impairment, and some may receive contrast for diagnostic imaging as well as for the procedure, which may place them at particular risk.

Unadjusted mortality is higher after urgent TAVI in most studies, although several did not find a significant difference after adjustment. Thirty-day mortality was 8.7% vs 4.3% in the TVT Registry (adjusted hazard ratio 1.28) [10], 5.3% vs 1.1% in the UK cohort [4] and 8% vs 2% after adjustment in the large US single-centre cohort [9]. In the lower-risk Australian cohort, unadjusted 30-day mortality was 2.9% vs 0.8%, but the difference was not significant after multivariable adjustment (adjusted hazard ratio 2.56; 95% CI 0.34-19.3) [11]. The smaller Israeli registry reported similar 30-day mortality and major adverse cardiovascular events in urgent and elective patients, although functional capacity at 30 days was reduced [7]. At longer follow-up, one-year mortality was 29.1% vs 17.5% in the TVT Registry [10], and two-year mortality was 33% vs 18% in the single-centre US cohort [9]. Twelve-month mortality was 14.3% vs 5.3% in the Australian cohort, and urgent status remained an independent predictor (adjusted hazard ratio 3.18). In that cohort, the survival curves separated within the first 90 days and ran in parallel thereafter [11]. The Californian cohort found higher unadjusted death rates at 30 days and one year, but no significant adjusted difference at one year (adjusted hazard ratio 1.76; 95% CI 0.86-3.62). Its urgent patients were, however, more likely to report no improvement in health-related quality of life at 30 days (16.7% vs 8.1%) [5]. Acute presentation also carries a substantial resource cost: the mean length of stay was 31.9 vs 6.1 days in the UK cohort [4], and the median stay was nine vs four days in the Australian cohort, mainly because of time spent in hospital before the procedure [11].

Four meta-analyses have examined these questions, although their populations and comparisons differ (Table *2*); three of them compared urgent or emergency TAVI with elective TAVI. Aparisi et al. combined seven studies including 84,427 patients, of whom 14,241 underwent emergency TAVI. Procedural success was slightly lower with emergency TAVI (92.5% vs 93.6%). Mortality was higher in hospital (5.7% vs 3.3%), at 30 days (8.8% vs 4.4%) and at one year (34.8% vs 19.7%). New dialysis (2.8% vs 1.1%) and mechanical circulatory support were needed more often after emergency procedures, and the authors identified both as the main determinants of death [6]. Shao et al. included 14 studies and 73,484 patients. They reported hazard ratios for death of 2.09 in hospital, 2.29 at 30 days and 1.96 at one year, with more acute kidney injury, dialysis, bleeding and early rehospitalisation, but no significant differences in vascular complications, pacemaker implantation, cerebrovascular events, paravalvular leak or device success [12]. Most recently, a reconstructed individual-patient-data meta-analysis of 11 studies and 77,108 patients found higher overall mortality with urgent TAVI over up to five years of follow-up (hazard ratio 1.83). In a landmark analysis, the excess hazard was confined to the first year (hazard ratio 1.96), with no difference thereafter (hazard ratio 1.01). Restricted mean survival time over five years was an estimated 6.5 months longer after elective TAVI [13].

Meta-analysis	Included studies, n	Patients, n	Comparison	Outcome	Effect measure	Estimate (95% CI)	P-value
Aparisi et al., 2021 [6]	7	84,427	Emergency vs elective TAVI	Procedural success	OR	0.84 (0.74-0.95)	0.005
				Acute kidney injury	OR	2.26 (1.84-2.76)	NR
				New dialysis	OR	2.37 (2.09-2.68)	<0.001
Shao et al., 2021 [12]	14	73,484	Emergent vs elective TAVI	In-hospital mortality	HR	2.09 (1.39-3.14)	NR
				30-day mortality	HR	2.29 (1.69-3.10)	NR
				1-year mortality	HR	1.96 (1.55-2.49)	NR
				Acute kidney injury	RR	2.48 (1.85-3.32)	NR
				Dialysis	RR	2.37 (1.95-2.88)	NR
						1.62 (1.27-	

				Bleeding	RR	2.08)	NR
				Cerebrovascular events	RR	1.11 (0.98-1.25)	NR
				Permanent pacemaker implantation	RR	1.05 (0.99-1.11)	NR
				Device success	RR	0.99 (0.97-1.01)	NR
Babaei et al., 2025 [13]	11	77,108	Urgent vs elective TAVI	Overall mortality (up to 5 years)	HR	1.83 (1.73-1.93)	<0.001
				Mortality in first year (landmark analysis)	HR	1.96 (1.85-2.08)	<0.001
				Mortality beyond first year (landmark analysis)	HR	1.01 (0.84-1.22)	0.83
				Restricted mean survival time at 5 years, elective minus urgent	RMST difference (months)	6.5 (5.2-7.9)	0.001
Kühne et al., 2025 [14]	17	2,811	eTAVI	30-day mortality	Pooled rate (%)	19 (17-20)	NR
					Pooled rate (%)	39 (32-46)	NR
				In-hospital mortality	Pooled rate (%)	11 (6-18)	NR
					Pooled rate (%)	40 (28-54)	NR
				1-year mortality	Pooled rate (%)	29 (20-40)	NR
					Pooled rate (%)	67 (58-74)	NR
				Major vascular complications	Pooled rate (%)	8 (7-10)	NR
					Pooled rate (%)	3 (0-23)	NR

TABLE 2: Published meta-analyses of emergency valve intervention in aortic stenosis

Values were taken from the full-text articles. For Aparisi et al. [6], the abstract and results section report different odds ratios for dialysis and mechanical circulatory support; the values shown are those given in the results section. For Aparisi et al. [6], Shao et al. [12] and Babaei et al. [13], ratios above 1 indicate a higher value in the emergency/urgent group, and the odds ratio below 1 for procedural success indicates lower success with emergency TAVI. The landmark estimates of Babaei et al. [13] include only patients alive at the start of each interval. Kühne et al. [14] reported single-arm pooled rates in patients with cardiogenic shock, not a direct comparison. The statistical tests and test statistics are not shown because they were not consistently reported.

TAVI: transcatheter aortic valve implantation; eTAVI: emergency TAVI; eBAV: emergency balloon aortic valvuloplasty; OR: odds ratio; HR: hazard ratio; RR: risk ratio; RMST: restricted mean survival time; CI: confidence interval; NR: not reported

These meta-analyses should not be read as independent confirmation of one another. Aparisi et al. [6] and Shao et al. [12] both include the STS/ACC TVT Registry [10], which contributes a large share of their patients, as well as other overlapping cohorts such as that of Landes et al. [7]. Their consistency therefore partly reflects shared data. The pattern across studies suggests that the excess risk of urgent TAVI is concentrated early after the procedure. However, a landmark analysis includes only patients who survive to the landmark, so it shows that one-year survivors of urgent and elective TAVI have similar subsequent survival; it cannot show that the excess risk disappears. It is plausible, but not proven, that the early excess reflects the severity of the acute illness rather than a less durable result.

Timing of TAVI during an unplanned admission

For patients who are admitted with decompensation, evidence is emerging that the speed of valve replacement matters. In the single-centre US cohort, 43 of 139 patients with acute heart failure underwent TAVI within 60 hours of arrival. Early TAVI did not reduce 30-day mortality significantly (5% vs 10%), but two-year mortality was lower (16% vs 40%), a difference that reached borderline significance after adjustment [9]. A UK registry included 276 patients who underwent TAVI during their index admission for a first episode of acute decompensated aortic stenosis. The median time from admission to TAVI was 22 days, so most of these were in-hospital procedures rather than emergency ones. Each additional five days was associated with a 9% higher adjusted risk of heart-failure hospitalisation or death over a median follow-up

of 4.6 years (hazard ratio 1.09; 95% CI 1.04-1.16) [15].

Both studies are observational, and the timing of TAVI is not randomly assigned. Clinicians are likely to expedite TAVI in the sickest patients, which would make early treatment look worse. Patients also have to survive the wait to receive TAVI at all, so those treated later are a selected group of survivors (survivor, or immortal-time, bias), which would make delay look safer. Both of these biases work against the association that was observed, so they do not explain it. In contrast, TAVI is often delayed by intercurrent problems such as infection, renal dysfunction or slow recovery from heart failure, and these may worsen prognosis independently of the delay, which would make delay look harmful. In the UK registry, baseline characteristics were similar above and below the median time to TAVI, and the analysis was adjusted for comorbidities, valve gradient and the need for organ support [15], but residual confounding remains likely. The net direction of bias is therefore uncertain. Even so, the findings support organising inpatient pathways so that definitive treatment is not delayed without good reason.

Balloon aortic valvuloplasty: rescue, bridge or detour?

In calcific aortic stenosis, BAV reduces the severity of stenosis mainly by fracturing calcific deposits within the valve leaflets, with a smaller contribution from stretching of the annulus [2]. It produces a moderate, immediate reduction in transvalvular gradient and can rapidly stabilise a patient in shock. However, the effect is short-lived: restenosis and clinical deterioration occur within 6-12 months in most patients [2,3]. It is therefore used as a bridge: to recovery of end-organ function, to clarification of the patient's prognosis and wishes or to definitive TAVI or surgery once the patient is fit enough. It can also be performed in centres without TAVI capability. The key comparative studies are summarised in Table *3*, and the meta-analysis in cardiogenic shock is included in Table *2*.

Study	Group A	Group B	Group A, n	Group B, n	Outcome (unit)	Group A result	Group B result	P-value
Bongiovanni et al., 2018 [8]	Emergency TAVI	Emergency BAV	23	118	Procedural mortality (%)	8.7	20.3	0.19
					30-day cardiovascular mortality (%)	23.8	33.0	0.40
Ali et al., 2021 [16]	Urgent/emergency TAVI	Urgent/emergency BAV	87	52	30-day survival (%)	97.7	88.5	<0.05
					1-year survival (%)	88.5	44.2	<0.001
Fujimoto et al., 2024 [17]	Direct TAVI	BAV bridge to TAVI	27,387	213	In-hospital mortality (%)	1.3	5.6	<0.0001
Masuda et al., 2025 [18]	BAV within 6 hours of admission	BAV more than 6 hours after admission	9	16	30-day mortality (%)	0	25	0.260
					Procedural complications (%)	0	12.5	0.520
					Time to weaning from mechanical support (mean, days)	2.9	7.8	0.008
					Time to start of rehabilitation (mean, days)	4.2	10.8	0.004

TABLE 3: Comparative studies of balloon aortic valvuloplasty in decompensated severe aortic stenosis

Values for Masuda et al. [18] were taken from the full-text article; values for Bongiovanni et al. [8], Ali et al. [16] and Fujimoto et al. [17] are as reported in the published abstracts. Bongiovanni et al. [8] also reported significantly more major vascular complications and stroke after emergency TAVI (p=0.01 for both). The statistical tests and test statistics are not shown because they were not consistently reported.

TAVI: transcatheter aortic valve implantation; BAV: balloon aortic valvuloplasty

In a five-centre German cohort of patients in cardiogenic shock or with severe acute dyspnoea, immediate procedural mortality was 8.7% after emergency TAVI (n=23) and 20.3% after emergency BAV (n=118). Thirty-day cardiovascular mortality was 23.8% and 33%, respectively, but neither difference was statistically significant, and adjusted analyses found no difference between groups. Notably, the 32 patients who later underwent elective TAVI after BAV still had a procedural mortality of 9.4%, and major vascular complications and stroke were more frequent after emergency TAVI [8]. A UK single-centre study comparing urgent or emergency BAV (n=52) with urgent or emergency TAVI (n=87) reported 30-day survival of 88.5% vs

97.7% and one-year survival of 44.2% vs 88.5%, with an adjusted hazard ratio of 11.2 for death at one year after BAV. Patients in the BAV group who went on to definitive valve replacement all survived to one year, which suggests that much of the mortality occurred in patients who never progressed beyond BAV [16]. In a Japanese nationwide database of 27,600 TAVI procedures, the 213 patients who underwent BAV as a bridge at least one day before TAVI had higher in-hospital mortality than those who underwent direct TAVI (5.6% vs 1.3%) [17].

When TAVI is not immediately available, the timing of BAV itself may matter. In a study from six Japanese centres without TAVI capability, patients in cardiogenic shock who underwent BAV within six hours of admission (n=9) were weaned from mechanical support and started rehabilitation sooner than those treated later (n=16). They also maintained their pre-admission frailty score, whereas frailty worsened in the delayed group. Thirty-day mortality was 0% vs 25%, though this difference was not statistically significant in so small a sample [18].

A 2025 meta-analysis of 17 studies and 2,811 patients with cardiogenic shock due to aortic stenosis reported pooled 30-day mortality of 19% after emergency TAVI and 39% after emergency BAV (Table *2*). In-hospital mortality was 11% vs 40% and one-year mortality 29% vs 67%. Major vascular complications were more frequent with TAVI (8% vs 3%) [14]. These figures confirm that mortality remains very high in this group, whichever strategy is used. They also reflect growing confidence in TAVI even in shock [19], a shift now reflected in the 2025 ESC/EACTS guidelines [1]. As in all of these comparisons, however, patients selected for BAV are often those judged too unstable, too frail or too uncertain in prognosis for TAVI. The mortality gap therefore cannot be attributed to the procedure alone.

Temporary mechanical circulatory support

In refractory cardiogenic shock, temporary mechanical circulatory support, such as a percutaneous microaxial pump (Impella) or veno-arterial extracorporeal membrane oxygenation, may be used to unload the left ventricle and maintain systemic perfusion while the valve is treated. Evidence for this approach is limited, and device choice is constrained by vascular access and by the need to keep access routes available for the valve procedure [3]. In the meta-analysis by Aparisi et al., mechanical circulatory support was needed more often during emergency than elective TAVI (3.56% vs 1.96%) and was among the main determinants of mortality [6]. In the TVT Registry, the use of cardiopulmonary bypass during urgent TAVI was associated with higher 30-day and one-year mortality [10]. A case report of three patients in cardiogenic shock described staged BAV followed by Impella support as a bridge to TAVI [20]. These data probably reflect the severity of illness in patients who need support, and they do not establish whether support itself improves outcomes.

Practical implications

Several practical messages emerge from the available evidence, and a suggested approach is summarised in Figure *1*. The figure reflects the authors' synthesis of observational data and has not been validated. First, the most effective strategy is prevention. Many patients who decompensate are already known to have severe stenosis [4], and both early mortality after urgent TAVI [13] and longer time to treatment [15] are associated with worse outcomes. In our view, waiting-list management should therefore include prioritisation by symptoms and haemodynamic severity, clear safety-netting advice and rapid re-triage of patients who deteriorate.

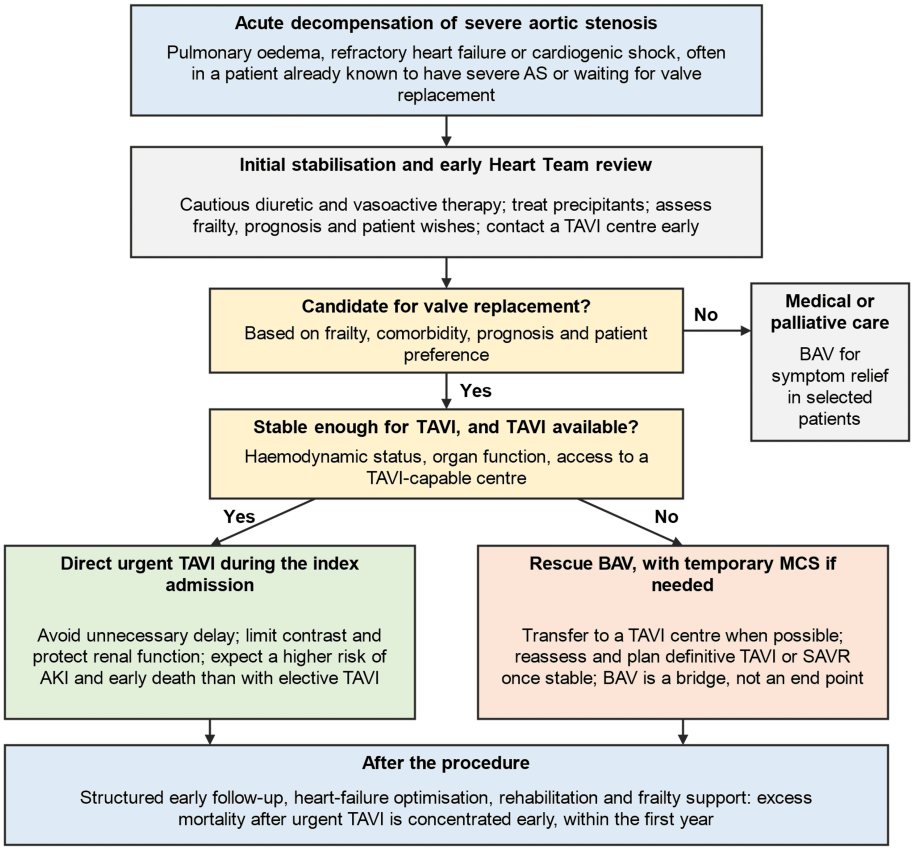


FIGURE 1: Suggested management pathway for decompensated severe aortic stenosis

Sources: cautious use of diuretic and vasoactive drugs and stand-alone BAV for selected patients who are not candidates for valve replacement [3]; Heart Team review and BAV as a bridge [1,2]; feasibility of direct urgent TAVI, renal risk and early mortality [10,11,13]; outcomes of BAV-first strategies [8,16,17]

AS: aortic stenosis; TAVI: transcatheter aortic valve implantation; BAV: balloon aortic valvuloplasty; MCS: mechanical circulatory support; SAVR: surgical aortic valve replacement; AKI: acute kidney injury

Second, when decompensation occurs and the patient is a candidate for valve replacement, early discussion with a Heart Team and transfer to a TAVI-capable centre allow direct TAVI to be performed during the index admission. The evidence indicates that this approach is feasible, with procedural success similar to elective TAVI [4,7,10,11]. Third, in line with the 2025 European guidelines [1], BAV now has a limited role: as a rescue procedure in carefully selected patients who are too unstable for TAVI, in centres without TAVI capability and when the benefit of definitive treatment is uncertain. It should be considered a bridge with a planned next step, not an end point [8,16,18]. For patients who are not candidates for valve replacement, care is medical or palliative, and BAV can be offered as a stand-alone procedure for symptom relief in selected patients with limited life expectancy [3].

Fourth, because acute kidney injury is the most consistent excess complication [5,10-12], renal protection deserves particular attention: limiting contrast, optimising haemodynamics and monitoring renal function closely. Finally, because the excess mortality after urgent TAVI is concentrated in the months after the procedure [11,13], these patients may benefit from structured early follow-up, optimisation of heart-failure therapy and attention to frailty and rehabilitation after discharge.

Limitations

The evidence base has important weaknesses. All primary comparisons are observational, and the allocation of patients to urgent TAVI, BAV or elective TAVI reflects clinical judgement, so residual confounding is likely despite statistical adjustment. Definitions of urgent, emergent and emergency procedures vary between studies, as do outcome definitions and follow-up. Studies of urgent TAVI include only patients who survived long enough and were judged suitable to undergo the procedure. This introduces survivor and selection bias and probably underestimates the true mortality of acute decompensation. Many series are single-centre,

several are small, and the meta-analyses largely pool overlapping registry data. Several source publications report figures in their abstracts that differ from those in their full text; we used the full-text values where these were available. Published data also rarely describe how long patients had been waiting before decompensation or what triggered it, which limits conclusions about waiting-list management. Finally, this review has its own limitations. The search was not systematic, was limited to two databases and English-language publications and may have missed relevant studies, and study selection and interpretation were not independently duplicated.

Conclusions

Acute decompensation of severe aortic stenosis is common, carries a high risk of death and often occurs in patients who are already known to need valve replacement. Urgent TAVI can be performed with procedural success comparable to elective TAVI. However, it is associated with more acute kidney injury and higher early mortality, although the size of the difference varies between studies, and the excess appears to be concentrated early after the procedure. Shorter time to TAVI during an unplanned admission is associated with better outcomes, although confounding by illness severity and survivor bias limit causal interpretation. BAV now has a limited role as a rescue or bridging option in carefully selected patients when direct TAVI is not possible, and outcomes after a BAV-first strategy are worse in observational comparisons. Faster elective pathways, prompt Heart Team decision-making when decompensation occurs and randomised trials with standardised definitions are needed to improve care for this high-risk group.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Mohamed Elgamal, Hamza Murad, Mohamed Abdelazim, Mohamed Elbouhi, Ahmed Abdullah, Mhd Anas Murad

Acquisition, analysis, or interpretation of data: Mohamed Elgamal, Hamza Murad, Mohamed Abdelazim, Mohamed Elbouhi, Abdulrahman Mahmoud Abdelhady Bayomi, Mohammed R. Mohsen

Drafting of the manuscript: Mohamed Elgamal, Hamza Murad, Mohamed Abdelazim, Mohamed Elbouhi, Abdulrahman Mahmoud Abdelhady Bayomi, Ahmed Abdullah, Mohammed R. Mohsen

Critical review of the manuscript for important intellectual content: Mohamed Elgamal, Hamza Murad, Mohamed Abdelazim, Mohamed Elbouhi, Mhd Anas Murad

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