

# Quality of Life after Mitral Valve Replacement or Repair in Children: A Comparative Study at the Cuomo Pediatric Cardiology Center

Papa Amath Diagne, Cheikh Abdou Khadr Faye, Momar Sokhna Diop, Papa Ousmane Ba, El Hadj Boubacar Ba, Nael Ka Fall, Momar Dioum, Marème Soda Mbaye, Moussa Seck Diop, Anta Mbaye Sall, Papa Salmane Ba, Amadou Gabriel Ciss

Department of Thoracic and Cardiovascular Surgery, Fann University Hospital Center, Dakar, Senegal

Email: [diagnepapaamath@gmail.com](mailto:diagnepapaamath@gmail.com)

**How to cite this paper:** Diagne, P.A., Faye, C.A.K., Diop, M.S., Ba, P.O., Ba, E.H.B., Fall, N.K., Dioum, M., Mbaye, M.S., Diop, M.S., Sall, A.M., Ba, P.S. and Ciss, A.G. (2026) Quality of Life after Mitral Valve Replacement or Repair in Children: A Comparative Study at the Cuomo Pediatric Cardiology Center. *Surgical Science*, 17, 79-87.

<https://doi.org/10.4236/ss.2026.173008>

**Received:** January 28, 2026

**Accepted:** March 14, 2026

**Published:** March 17, 2026

Copyright © 2026 by author(s) and Scientific Research Publishing Inc.

This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

## Abstract

This retrospective–prospective cohort study conducted between January 2017 and January 2019 included 60 children who underwent surgery for mitral valve disease at the Cuomo Pediatric Cardiology Center in Dakar, Senegal. The objective was to evaluate clinical and paraclinical outcomes, as well as quality of life (QoL), before and after mitral valve replacement (MVR) or mitral valve repair (MVr). Quality of life was assessed using an adapted and abbreviated version of the SF-36 questionnaire. Significant postoperative improvement in QoL was observed in both groups. Mean global scores increased from 42.35 to 73.73 after MVR and from 40.19 to 72.61 after MVr, with no statistically significant difference between techniques. Improvements were noted across multiple domains, including vitality, physical autonomy, emotional status, social functioning, pain, and perceived future health. Dyspnea improved more markedly in the MVr group, whereas no significant change was observed in the MVR group for this dimension. Most patients (66.7%) experienced uncomplicated postoperative outcomes. Postoperative echocardiography demonstrated satisfactory functional recovery, with a mean left ventricular ejection fraction of 66.2% in the MVr group and 62.7% in the MVR group. In conclusion, both mitral valve repair and replacement significantly improved quality of life in this pediatric cohort, with comparable medium-term outcomes. Surgical strategy should be individualized according to anatomical characteristics and clinical context.

## Keywords

Quality of Life, Mitral Valve Replacement, Mitral Valve Repair, Senegal

## 1. Introduction

Mitral regurgitation is a common condition in children in developing countries, where it is most often of rheumatic origin. At an advanced stage, the reference treatment is surgical, either mitral valve replacement (MVR) or mitral valve repair (MVRr). However, few studies have focused on the impact of these interventions on quality of life (QoL) in children within the African pediatric context. Assessing QoL in this population is essential, as it allows evaluation not only of clinical surgical outcomes but also of the functional, emotional, and social dimensions of child development. Standardized instruments such as the SF-36, although originally developed for adults, have been adapted and validated in certain pediatric populations, allowing a comprehensive assessment of perceived health status. In resource-limited settings, where access to specialized cardiology follow-up and re-intervention may be restricted, the choice between mitral valve repair and replacement depends not only on anatomical criteria but also on logistical and socioeconomic considerations. Therefore, comparative data on the medium-term effects of these two surgical approaches (particularly in terms of quality of life) are needed. The primary objective of this study is to compare changes in quality of life among children who underwent mitral valve repair or mitral valve replacement at the only referral pediatric cardiac center in Senegal, in order to determine whether one technique provides a superior benefit in this regard. This analysis aims to inform therapeutic decision-making in resource-limited settings.

## 2. Patients and Method

This was a combined retrospective (preoperative quality of life) and prospective (postoperative quality of life) cohort study conducted at the Cuomo Pediatric Cardiology Center of Fann Hospital in Dakar, Senegal. The study included all patients who underwent mitral valve replacement (MVR) or mitral valve repair (MVRr) between January 2017 and January 2019. Of the 95 medical records initially identified, 60 patients were included in the final analysis. Excluded were patients lost to follow-up or not reachable ( $n = 22$ ), those with psychiatric disorders (including depressive states or relational disorders) likely to compromise the validity of questionnaire responses, and patients who had died before postoperative evaluation ( $n = 13$ ), resulting in a total of 35 exclusions.

The indication for surgery (MVR or MVRr) was established based on clinical and paraclinical evaluation, including transthoracic echocardiography, chest radiography, and electrocardiography. Preoperative clinical and paraclinical data were extracted retrospectively from medical records.

Quality of life (QoL) was assessed using a structured questionnaire administered by telephone at follow-up. Assessment was performed in two phases: retrospectively for the preoperative period and prospectively for the postoperative period. Because no standardized QoL questionnaire had been administered at the time of surgery, preoperative QoL was reconstructed retrospectively during follow-up interviews conducted after a mean postoperative interval of four years.

Patients—or their parents, in the case of younger children—were asked to recall their health status and functional limitations during the weeks preceding surgery.

We acknowledge that this retrospective assessment of baseline QoL may introduce recall bias and potential response-shift bias, as current health status may influence recollection of preoperative well-being. To mitigate this risk, the questionnaire emphasized concrete and function-based domains (e.g., NYHA dyspnea class, limitations in daily physical activities, school participation) rather than purely subjective perceptions. Whenever possible, recalled information was cross-checked against documented preoperative clinical findings.

To ensure adequate comprehension, the questionnaire was translated into Wolof when French was not sufficiently mastered.

The quality-of-life assessment tool was an adapted and abbreviated version of the Short Form-36 (SF-36), reduced to ten dimensions: global health status, vitality, physical autonomy, dyspnea (according to the NYHA classification and scored on a 1 - 4 scale, where higher scores indicate **less** functional limitation (*i.e.*, better function)), physical capacity, emotional status, social functioning, pain, dynamism, and perceived future health. Each item was scored using a specific numerical scale, allowing calculation of a global score out of 100 points.

Two standardized data collection forms were developed for each patient: one for clinical and paraclinical data (age, sex, functional symptoms, ECG and echocardiographic findings, and intraoperative data), and the other for pre- and post-operative quality-of-life assessment. Data were entered using Sphinx software and analyzed with SPSS (version 23). Descriptive analyses were performed, and comparisons between the MVR and MVr groups were conducted using appropriate statistical tests, including Student's *t* test for quantitative variables and the Wilcoxon test for paired score comparisons.

### 3. Results

#### 3.1. Population Characteristics and Operative Data

Among the 60 patients included in the study, 34 (56.7%) underwent mitral valve replacement (MVR), including 31 with a mechanical prosthesis and 3 with a bio-prosthesis. The remaining 26 patients (43.3%) underwent mitral valve repair (MVr). The mean age at the time of surgery was 12 years (range: 6 - 17 years), whereas at postoperative assessment—performed after a mean follow-up of 4 years—the mean age was 16 years (range: 9 - 21 years). The median age was 13 years (range: 10 - 17 years) in the MVR group and 11 years (range: 10 - 16 years) in the MVr group. Sex distribution showed a slight female predominance (51.7%), with a male-to-female ratio of 0.9. Postoperative outcomes were uncomplicated in 40 patients (66.7%), including 21 cases in the MVR group (61.8%) and 19 cases in the MVr group (73.1%). Hemodynamic complications occurred in 5 patients after MVR (14.7%) and in 4 after MVr (15.4%). Postoperative infections were reported in 2 patients in the MVR group (5.8%) and in 1 patient in the MVr group (3.8%). Rhythm or conduction disturbances were documented in 5 patients after

MVR (14.7%) and in 2 patients after MVr (7.7%). A single case of pericardial effusion was also observed in the MVR group. Overall, six patients (10%) experienced postoperative dyspnea, including 5 in the MVR group and 1 in the MVr group, most commonly classified as NYHA functional class I-II. Other residual symptoms, such as palpitations and chest pain, were reported in 7 patients (4 MVR, 3 MVr). At discharge, the most frequently prescribed treatments were angiotensin-converting enzyme inhibitors (ACE inhibitors) (78.3%), diuretics (71.7%), and iron supplementation (70%). Antibiotic therapy was initiated in 16 patients (26.7%), analgesics in 14 (23.3%), and oral anticoagulation with vitamin K antagonists in 37 patients (61.7%). Among the latter, 5 patients (13.5%) experienced at least one minor hemorrhagic event (epistaxis or gingival bleeding). Regular cardiology follow-up was ensured for 54 patients (90%), including at least one annual consultation. The electrocardiogram (ECG) was normal in 25 patients (41.7%), including 17 in the MVR group and 8 in the MVr group. Conversely, 35 patients (58.3%) showed ECG abnormalities (rhythm, conduction, or repolarization disorders), which were more frequent in the MVr group (24 cases, 68.5%) than in the MVR group (11 cases, 31.4%). On echocardiography, the mean postoperative left ventricular ejection fraction (LVEF) was 66.2% in the MVr group compared with 62.7% in the MVR group. Persistent pulmonary arterial hypertension (PAH) was observed in 4 patients, including 2 in the MVr group and 2 in the MVR group. The mean TAPSE (an index of right ventricular function) was 20.9 mm in the MVr group versus 15.9 mm in the MVR group.

### 3.2. Quality of Life Assessment (Table 1 and Table 2)

Analysis of quality-of-life scores showed a significant improvement in both groups after surgery. In the MVR group, the mean global score increased from 42.35 to 73.73 points (+31.38). In the MVr group, scores increased from 40.19 to 72.61 points (+32.42). However, direct comparison between the two surgical techniques showed no statistically significant difference in total QoL score, either preoperatively ( $p = 0.348$ ) or postoperatively ( $p = 0.608$ ). Regarding perceived global health status (Q1), scores improved from 1.09 to 3.03 in the MVR group and from 1.04 to 2.92 in the MVr group, reflecting a marked improvement from a health status perceived as “poor/fair” to “good/excellent”, preoperative scores were similar between groups ( $p = 0.668$ ), and no significant difference was observed postoperatively ( $p = 0.293$ ). Similar improvements were observed in vitality (Q2), physical autonomy (Q3), social functioning (Q7), pain (Q8), and perceived future health (Q10). Postoperative comparisons between MVR and MVr revealed no statistically significant differences for these domains (all  $p > 0.05$ ), despite numerically higher scores in the MVR group for certain dimensions.

Dyspnea (Q4), assessed according to the NYHA classification and scored on a 1 - 4 scale (higher scores indicating better functional status), showed a statistically significant difference between groups preoperatively ( $p < 0.001$ ). The MVR group had a higher baseline mean score than the MVr group (3.91 vs 2.96), indicating

**Table 1.** Comparison of quality of life before MVR and MVr.

Quality-of-life assessment questions	Mean before MVR [min - max]	Mean before MVr [min - max]	P-value
Q1: Global health status	1.09 [1 - 3]	1.04 [1 - 2]	0.668
Q2: Vitality	1.24 [1 - 3]	1.15 [1 - 2]	0.651
Q3: Physical autonomy	14.15 [11 - 20]	14 [10 - 19]	0.194
Q4: Dyspnea	3.91 [3 - 4]	2.96 [2 - 4]	0.000
Q5: Physical capacity	4.18 [3 - 8]	3.85 [3 - 5]	0.520
Q6: Emotional status	4.1 [3 - 5]	3.88 [1 - 6]	0.071
Q7: Social functioning	1.15 [1 - 2]	1.23 [1 - 3]	0.510
Q8: Pain	3.2 [2 - 4]	3.19 [2 - 5]	0.639
Q9: Dynamism	7.4 [6 - 18]	6.88 [6 - 9]	0.868
Q10: Perceived future health	2 [2 - 2]	2 [2 - 2]	NA
<b>Total</b>	42.35 [35 - 54]	40.19 [33 - 48]	0.348

**Table 2.** Comparison of quality of life after MVR and MVr.

Quality-of-life assessment questions	Mean after MVR [min - max]	Mean after MVr [min - max]	P-value
Q1: Global health status	3.03 [2 - 6]	2.92 [1 - 4]	0.293
Q2: Vitality	2.97 [2 - 3]	2.92 [1 - 3]	0.355
Q3: Physical autonomy	21.82 [15 - 24]	21.38 [9 - 24]	0.144
Q4: Dyspnea	3.91 [3 - 4]	3.92 [2 - 4]	0.162
Q5: Physical capacity	5.29 [3 - 6]	4.96 [3 - 6]	0.110
Q6: Emotional status	5.44 [3 - 6]	5.15 [1 - 6]	0.216
Q7: Social functioning	2.88 [2 - 3]	2.81 [1 - 3]	0.514
Q8: Pain	5.94 [4 - 6]	5.81 [3 - 6]	0.502
Q9: Dynamism	17 [6 - 19]	17.08 [9 - 18]	0.748
Q10: Perceived future health	3.44 [2 - 4]	3.65 [2 - 13]	0.541
<b>Total</b>	73.73 [56 - 79]	72.61 [40 - 87]	0.608

less severe dyspnea in the MVR group before surgery. Postoperatively, mean dyspnea scores increased to 3.91 in the MVR group and 3.92 in the MVr group, with no statistically significant difference between the two techniques at follow-up ( $p = 0.162$ ). Within-group analysis showed no significant change in the MVR group (3.91 to 3.91), consistent with a ceiling effect, whereas the MVr group demonstrated a marked increase from 2.96 to 3.92, reflecting significant functional improvement. Physical capacity (Q5) scores increased from 4.18 to 5.29 in the MVR group and from 3.85 to 4.96 in the MVr group. However, no statistically significant difference was observed between the two techniques either preoperatively ( $p = 0.520$ ) or postoperatively ( $p = 0.110$ ).

Emotional status (Q6) improved from 4.1 to 5.44 in the MVR group and from 3.88 to 5.15 in the MVr group, with no significant intergroup difference before surgery ( $p = 0.071$ ) or after surgery ( $p = 0.216$ ). Similarly, dynamism (Q9) increased markedly in both groups, from 7.4 to 17.00 points in the MVR group and from 6.88 to 17.08 points in the MVr group, without significant differences between groups preoperatively ( $p = 0.868$ ) or postoperatively ( $p = 0.748$ ). Detailed comparisons of quality-of-life scores for each dimension before and after surgery are presented in **Table 1** and **Table 2**.

### 3. Discussion

In our series, the mean age at the time of surgical intervention was  $12 \pm 3$  years (range: 6 - 17 years), which is substantially younger than that reported by Diagne *et al.* [1] in Senegal ( $30 \pm 11$  years), whose study focused on an adult population. These findings also contrast with those of Coulibaly in Mali [2], who reported a mean age of  $25.2 \pm 11.5$  years. The predominance of patients aged 15 to 19 years (68.3%) reflects the peak incidence of symptomatic valvular heart disease during adolescence. This age profile, frequently observed in African series [1]-[4], is mainly explained by the high prevalence of rheumatic heart disease on the continent. The tendency to favor mitral valve repair (MVr) in younger children partly accounts for the higher mean age observed in the mitral valve replacement (MVR) group. In contrast, in industrialized countries, degenerative valvular diseases predominate, with a mean age at surgery generally exceeding 48 years [5] [6]. In our study, age was not identified as a factor influencing postoperative quality of life. Sex distribution showed a slight female predominance (51.7%), consistent with findings from other studies conducted in sub-Saharan Africa [1] [2] [7]-[10]. This pattern contrasts with Western series, in which surgically treated patients are predominantly male [6]. From a surgical standpoint, the majority of patients in our study underwent mitral valve replacement (MVR) (56.7%), with a marked predominance of mechanical prostheses (91.2%). This preference is largely explained by economic considerations and the desire to minimize the need for reintervention. Diagne [1] reported similar findings, with 70% of patients undergoing MVR, predominantly with mechanical valves. In contrast, Coulibaly [2] reported a slightly higher proportion of valve replacements, illustrating variations in surgical strategy depending on local contexts. Postoperative ECG abnormalities were more frequent in the MVr group (68.5%) than in the MVR group (31.4%), a finding that appears paradoxical given that replacement is typically performed in more advanced disease. This difference may be explained by the greater surgical manipulation involved in valve repair (particularly annuloplasty and subvalvular reconstruction) which may increase the risk of conduction tissue irritation near the atrioventricular junction. Additionally, patients undergoing repair may have had better-preserved myocardial function, allowing rhythm disturbances to be more readily detected, whereas advanced remodeling in replacement cases may mask such abnormalities. Pre-existing but previously silent conduction disturbances

may also have become apparent during systematic postoperative monitoring. Although most abnormalities were clinically mild, further prospective electrophysiological studies are needed to clarify their long-term significance. Similar observations have been reported in other Senegalese series [3] [4] and warrant further investigation regarding their prognostic significance. On echocardiography, the mean left ventricular ejection fraction (LVEF) was slightly higher in the MVr group (66.2%) than in the MVR group (62.7%), suggesting better preservation of systolic function in patients who underwent mitral valve repair. These findings are consistent with those reported by Diagne *et al.* [1], who observed a mean postoperative LVEF of 65.59%.

Quality-of-life (QoL) assessment demonstrated a significant improvement in scores in both groups, with no statistically significant difference between mitral valve repair (MVr) and mitral valve replacement (MVR). Dimensions such as perceived future health, vitality, physical autonomy, social functioning, and pain all showed postoperative improvement. These findings are consistent with those reported by Diagne [1], who observed significant improvements across several domains, particularly vitality, pain, and social relationships, with scores increasing from 1.87 to 2.89, 4.19 to 5.67, and 2.69 to 2.86 on their respective scales.

Similarly, the study by Paul S. Myles [11] provides additional support for these observations, reporting significant postoperative increases in vitality (48 to 66), social functioning (63 to 81), bodily pain (62 to 100), and mental health (73 to 81), all expressed on a 100-point scale. Regarding perceived global health status (Q1), scores increased from 1.09 to 3.03 after MVR and from 1.04 to 2.92 after MVr (on a 4-point scale), reflecting a marked improvement that was slightly more pronounced in the MVR group. These results are comparable to those reported by Diagne [1], who noted an increase from 1.39 to 3.26.

Dyspnea (Q4), assessed according to the NYHA classification, showed a notable improvement, with mean scores increasing to approximately 3.91 - 3.92 (NYHA class I-II) in both groups, in line with the findings of Diagne [1], who reported an improvement from a mean of 2.47 to 3.87. For physical capacity (Q5), scores increased from 4.18 to 5.29 in the MVR group and from 3.85 to 4.96 in the MVr group (on a maximum scale of 6 points), indicating a more pronounced improvement among patients who underwent valve replacement. Diagne [1] reported a similar progression (4.89 to 6.61 on an 8-point scale), as did Myles [11], who observed an increase from 51 to 72 on a 100-point scale.

Regarding emotional status (Q6), scores improved from 4.1 to 5.44 after MVR and from 3.88 to 5.15 after MVr, again showing a slight advantage in the MVR group. Diagne [1] reported a comparable improvement (4.11 to 5.19), while Myles [11] observed an increase from 55 to 73 in the emotional role dimension. It should be noted, however, that our study did not assess certain key aspects of quality of life, such as school or social reintegration, which remain insufficiently documented in African studies involving children with valvular prostheses. The preoperative quality-of-life assessment relied on retrospective recall, collected after a

mean follow-up of four years. This introduces a potential recall bias, particularly in emotional and subjective domains, which may have influenced the accuracy of preoperative QoL scores. However, the standardized questionnaire and structured interview methodology were designed to mitigate this bias. In addition, the attrition rate may have introduced survivorship bias, as only patients alive and reachable at follow-up were included in the QoL assessment. Consequently, the analyzed population may represent a subset with more favorable postoperative trajectories, potentially leading to an overestimation of quality-of-life improvement.

#### 4. Conclusion

This study assessed changes in quality of life after mitral valve surgery in an exclusively pediatric cohort treated at the Cuomo Pediatric Cardiology Center in Dakar between 2017 and 2019. Using an adapted SF-36 questionnaire, we demonstrated a significant improvement in quality of life after both mitral valve repair (MVr) and mitral valve replacement (MVR). Score improvements involved nearly all evaluated dimensions, including global health status, vitality, autonomy, physical capacity, emotional status, social functioning, pain, dynamism, and perceived future health. Improvements in vitality were observed in both groups. While the MVR group exhibited numerically higher postoperative scores, no statistically significant difference was found between MVR and MVr ( $p = 0.355$ ), indicating comparable functional recovery. Both MVR and MVr were associated with significant improvements in physical autonomy and emotional status, with no statistically significant difference between techniques. In contrast, dyspnea improved more markedly in the MVr group and represented the only domain in which the MVR group did not demonstrate a significant within-group change. These findings confirm that mitral valve surgery improves quality of life in children, with different patterns of recovery depending on the surgical technique. However, no statistically significant overall difference was observed between the two groups after a mean follow-up of four years. Surgical strategy should therefore be guided primarily by anatomical characteristics, technical feasibility, and the patient's specific clinical context. A total of 22 patients (23%) were lost to follow-up, and 13 (13.7%) died before postoperative assessment. This attrition rate may introduce selection bias, potentially overestimating the observed improvements in QoL. Nonetheless, the relatively high follow-up rate (63.2%) and exclusion of cognitively impaired individuals were necessary to preserve the validity of self-reported outcomes.

Furthermore, the relationship between changes in quality of life and electrocardiographic or echocardiographic abnormalities requires further investigation. The paradoxically higher rate of postoperative ECG abnormalities in the MVr group (68.5% vs 31.4% in MVR) may reflect pre-existing conduction anomalies not resolved by repair, or surgical trauma in anatomically complex repairs. Alternatively, some children selected for repair may have had subtle conduction abnormalities undetected prior to surgery. Further electrophysiologic studies are warranted to elucidate this observation and its prognostic implications. Large-scale

multicenter studies are needed to refine these findings and to identify predictors of optimal quality-of-life recovery after mitral valve surgery in the pediatric population.

### Conflict of Interest Statement

The authors declare that they have no competing interests.

### References

- [1] Diagne, P.A., Ciss, A.G., Diop, M.S., Ba, P.S., Dieng, P.A., Sow, N.F., *et al.* (2016) Résultats et évaluation de la qualité de vie après remplacement valvulaire cardiaque. *Journal Africain de Chirurgie*, **4**, 76-82.  
<https://doi.org/10.61585/pud-jafrcbir-v4n206>
- [2] Coulibaly, M., Koita, S.A., Diallo, B., Traoré, S.I., Zongo, R.A., Doumbia, M., *et al.* (2021) First Malian Series of Surgery for Rheumatic Valve Disease: Opening of the Centre, Clinical Features and Peri-Operative Realities. *The Cardiovascular Journal of Africa*, **32**, 389-393.
- [3] Ba, M., Sow, S., Ndiaye, M.B., Kane, A. and Ba, S.A. (2007) Chirurgie reconstructrice de l'insuffisance mitrale rhumatismale de l'enfant: Techniques et résultats à propos de 24 cas opérés à Dakar. *Annales Africaines de Chirurgie Thoracique et Cardio-Vasculaire (AACTCV)*, **2**, 42-45.
- [4] Ba, S.A., Kane, A., Hane, L., Diop, I.B. and Sarr, M. (1998) Cardiopathies rhumatismales au Sénégal: Aspects cliniques et thérapeutiques. *Cardiol Trop*, **24**, 31-37.
- [5] Acar, J. (1985) Le devenir éloigné des prothèses mécaniques. *Annales de Cardiologie et d'Angéiologie (Paris)*, **34**, 187-189.
- [6] Acar, J. (2008) Valvulopathies acquises: Rapport d'activité hospitalo-universitaire 1954-2008. Hôpital de la Salpêtrière, 81 p.
- [7] Balaka, A., Tchamdja, T., Djibril, M.A., Djangadou, K.A., Tchandana, M., Damorou, F., *et al.* (2015) Les valvulopathies cardiaques en milieu hospitalier à Lomé (Togo). *Pan African Medical Journal*, **20**, Article No. 168.  
<https://doi.org/10.11604/pamj.2015.20.168.4979>
- [8] Barsaoui, S. (2005) Rhumatisme articulaire aigu chez l'enfant. *EMC-Pédiatrie*, **2**, 243-255. <https://doi.org/10.1016/j.emcped.2005.04.001>
- [9] Belco, M., Oumar, B.H., Karamoko, S., Adama, D., Nouhoum, S., Elmouloud, C.M., *et al.* (2018) Epidemiological and Clinical Study of Cardiac Diseases in the Pediatric Department of the University Hospital Gabriel Touré (UH GT), Bamako (Mali). *World Journal of Cardiovascular Diseases*, **8**, 328-336.  
<https://doi.org/10.4236/wjcd.2018.87032>
- [10] Dioum, M., Badiane, P., Diagne, P.H., Hanifa, I.I.M., Kane, A., Gaye, C., *et al.* (2023) Survey on the Level of Knowledge of Pharmacists in the Follow-Up of Patients on Vitamin K Antagonists. *Journal of Clinical and Experimental Cardiology*, **14**, Article ID: 1000847.
- [11] Hunt, J.O., Hendrata, M.V. and Myles, P.S. (2000) Quality of Life 12 Months after Coronary Artery Bypass Graft Surgery. *Heart & Lung*, **29**, 401-411.  
<https://doi.org/10.1067/mhl.2000.110578>