# Budgetary impact and health outcomes of implementing new treatment guidelines for heart failure in Norway

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## Background and objective

In the updated European Society of Cardiology guidelines (ESC 2021) for heart failure with reduced ejection fraction (HFrEF), angiotensin receptor neprilysin inhibitors (ARNI) are included as a first-line treatment option. Nonetheless, ARNIs are currently reimbursed in Norway as later-line treatment, substituting angiotensin-converting enzyme inhibitors or angiotensin-receptors blockers (ACEi/ARB) in symptomatic patients.

The **objective** of this study was to **estimate the budgetary and health impact of increasing the use of ARNI in first line HFrEF treatment** as a consequence of **implementing and adhering to the updated international guidelines** in Norway.

## Methods

An economic model (decision tree followed by semi-Markov model) was developed to compare conventional care to an interpretation of the ESC 2021 HFrEF treatment guidelines [1] where an increased proportion of patients receive ARNI first line (see Figure 1). Incident cohorts were included in the model on an annual basis and followed over ten years. The main elements of the analysis are summarized in Table 1.

**Figure 1: Key inputs**


## Results

The results indicate that increasing the proportion of patients receiving ARNI over the next ten years would imply additional life years gained (+1,165 LY) and prevented hospitalizations (-651), also implying increased health care expenditure (+123 million NOK), based on an eligible population of ~56,000 patients.

**Table 2. Health benefits and budget impact analysis results (undiscounted)**

| | Health benefits | | | Costs (Norwegian krona, millions) | | | |
|---|---|---|---|---|---|---|---|
| | Total LY | Deaths | Hospita-lizations | Drug acquisition | Monitoring | Hospita-lization | Total budget |
| Conventional care | 257,753 | 12,313 | 21,544 | 1,050.24 | 1,636.64 | 1,533.73 | 4,220.62 |
| ESC 2021 guidelines | 258,918 | 12,033 | 20,893 | 1,211.78 | 1,644.44 | 1,487.41 | 4,343.23 |
| **Incremental** | **1,165** | **-280** | **-651** | **161.53** | **7.39** | **- 46.32** | **122.60** |

**Figure 2: Health benefits results (incremental)**

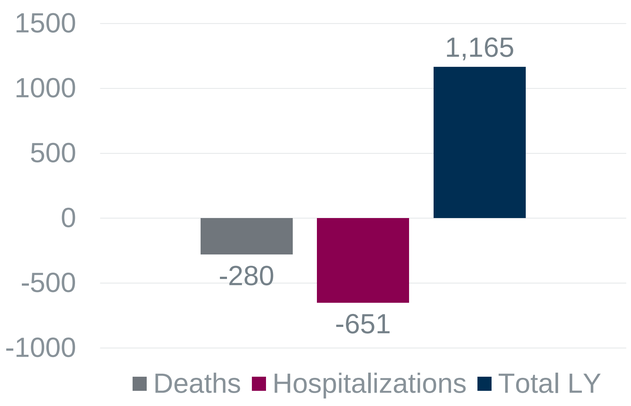
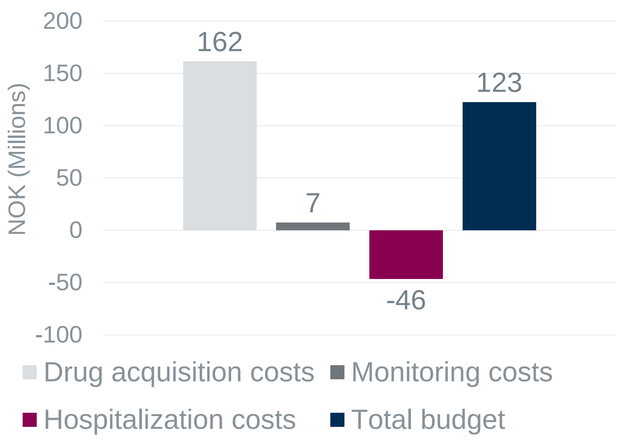



**Figure 3: Budget impact results (incremental)**




Abbreviations: 1L: First line; ACEI: angiotensin-converting enzyme inhibitors; ARB: angiotensin-receptor blockers; ARNI: angiotensin receptor neprilysin inhibitors, eGFR: estimated glomerular filtration rate, ESC: European Society of Cardiology, LYG: life years gained; MRA: mineralocorticoid receptor antagonists, NYHA: New York Heart Association; SGLT2: Sodium/glucose cotransporter-2 inhibitors.

**Table 1: Analysis description**

| Aspect | Details |
|---|---|
| Analytical method | Decision tree followed by semi-Markov model. The decision tree represents the way patients are treated during the year of diagnosis while the Markov model represents how patients are treated over the course of the model time horizon, allowing patients to change treatments over time, and mortality. |
| Perspective | Norwegian payer perspective |
| Time horizon (cycle length) | 10 years (1 year) |
| Discounting | Not applied |
| Intervention and comparator | • Current conventional care<br>• Care by interpretation of ESC 2021 treatment guidelines |
| Half-cycle correction | Yes |
| **Input** | |
| Epidemiological data defining the eligible population | • Incidence of heart failure<br>• Proportion of patients with heart failure with reduced ejection fraction<br>• Proportion of patients with NYHA II-IV<br>• Proportion of patients with eGFR>30ml/min<br>• Proportion without hypotension |
| Treatment distributions | • ARNI prescription: see Figure 1.<br>• Add-on treatment distribution is assumed identical in both arms: No add-on treatment (10%), +SGLT2i (40%) and + MRA and SGLT2i (50%). Derived from Norwegian clinical expert opinion. |
| Treatment discontinuation | • Not included during first year of diagnosis<br>• Year after diagnosis: ARNI (18.9%) [2], MRA (35.1%) [2], SGLT2i (5%, assumption). No rates were included for ACEi. ARB and BB.<br>• For subsequent years, rates were assumed to be 10% of those during the year after diagnosis (above) |
| Treatment specific mortality and hospitalization | Derived from published literature and internal analysis [3-5] |
| Loss of exclusivity (LoE) | Effect of patent expiry on drug acquisition costs for ARNI (2026) and SGLT2i (2025) is included (year of LoE: assumption) [6] |
| Costs | Drug acquisition, treatment monitoring, hospitalization. Derived from public price lists [7,8] |
| **Scenario analyses** | |
| **Scenario 1**: Updated guidelines based on the ACC 2021 [9] recommendations interpretation by clinical experts. Proportion of patients prescribed with ARNI is assumed to be 90%. | |
| **Scenario 2**: Treatment discontinuation not included. Patients are assumed not to discontinue treatment. | |
| **Scenario 3**: Treatment switching is included (6.2%) [2]. Patients can switch from ACEi/ARB to ARNI from the year following diagnosis and onwards. | |

**Figure 4: Scenario analyses, incremental results for life years gained**

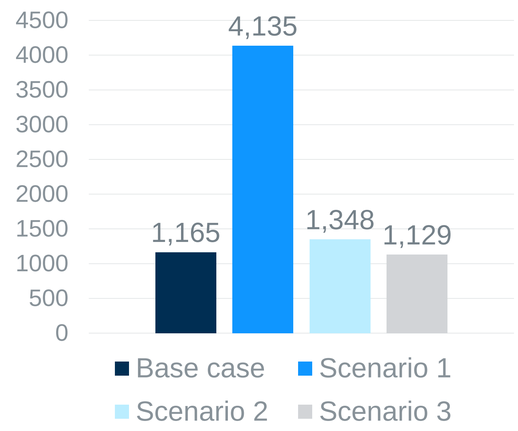
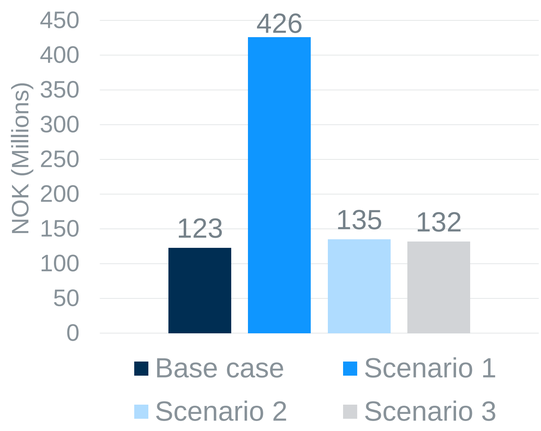



**Figure 5: Scenario analyses, incremental results for budget impact**




## Discussion and conclusion

- **Adhering to the updated treatment guidelines for HFrEF patients in Norway is expected to provide health benefits at an additional cost to society.**
- These findings align with previous studies suggesting that replacing ACEi with ARNI for the treatment of HFrEF could be cost-effective, but not cost saving [10, 11].
- Limitations: Implementation of guidelines in clinical practice is likely more complex than assumed in the analysis. Data for estimating health benefits as quality-adjusted life years is not sufficient.

## REFERENCES

1. ESC guidelines. European Heart Journal, 2021(00): p. 1–28.
2. Savarese, G., et al. Eur. J. Heart Fail. 2021(23): p. 1499-1511.
3. McMurray, J. NEJM, 2014. 371(11): p. 993-1004.
4. Tromp, J. JACC: Heart Failure, 2022. 10(2): p. 73-84.
5. Vaduganathan, M. The Lancet, 2020. 10244 (396): p. 121-128.
6. Legemiddelverket. 2022; Available from: https://legemiddelverket.no/offentlig-finansiering/trinnpris#trinnprismodellen.
7. Legemiddelverket, Legemiddelsøk (online). 2022.
8. Helsedirektoratet, Innsatsstyrt finansiering (online). 2021.
9. ACC guidelines. JACC: Heart Failure, 2021. 77(6): p. 772-810
10. Grant, A.. CJC Open, 2020: p. 447-453.
11. Proudfoot. Eur J Health Econ, 2022.



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