

# Economic Burden of Adverse Clinical Outcomes Associated with Intraoperative Hypotension in High-Risk Non-Cardiac Surgery in Spain

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## BACKGROUND AND OBJECTIVES:

Intraoperative hypotension (IOH) is associated with higher risk of mortality and other major clinical events. Recent studies have demonstrated this relationship considering diverse definitions of IOH severity in non-cardiac surgery<sup>1,2</sup>. However, the impact on the Spanish Healthcare System remains unclear. This study aims to assess the economic burden of adverse clinical outcomes (ACOs) associated with IOH in high-risk non-cardiac surgery in Spain.

## METHODS:

RAE-CMBD, a Spanish Ministry of Health's database using ICD-10 codification, was used to extract the number of non-cardiac high-risk surgical procedures performed each year (2016-2019) in Spain<sup>3</sup>, as well as the costs of managing ACOs (using DRGs). A list of procedures was included, comprising Hepatectomy, Pancreatectomy, Esophagectomy, Gastrectomy, Colectomy, Resection of the rectum, large intestine, and caecum, Hysterectomy, Hip replacement, Open reduction-femur fracture and Cystectomy. Data from large cohort studies with different severity profiles and intervention set were used to estimate the risk of ACOs (i.e.) based on IOH severity (<65mmHg). The number of surgeries was distributed between thresholds of severity or duration of hypotension according to the population of the studies to estimate number of ACOs. Unitary cost (€,2021) from national tariffs DRGs were considered in a conservative approach. The ACOs included were: Acute Kidney Injury (AKI), mortality, Acute Myocardial Infarction (AMI) or Myocardial Injury after Non-Cardiac Surgery(MINS), Acute Ischemic Stroke (AIS), Delirium, Kidney Failure and Sepsis.

## RESULTS:

186,648 (2016) and 203,395 (2019)(Figure 1) non-cardiac surgical procedures were categorized as of high-risk, with an annual increase of 2.17%. Estimated IOH incidence was a minimum of 19%<sup>1</sup>, with patients suffering a mean 4,354 ACOs per year (including 1,085 deaths at 90 days per year, Figure 2) with a mean cost of 21.8 million euros per year (Figure 3). In another analysis using estimates from another publication with a higher severity profile and an IOH incidence of 72%, patients suffered a mean 13,909 ACOs (only considering acute kidney injury and myocardial injury), with a mean cost of 56.4 million euros (Figure 4)<sup>2</sup>.

Figure 1. Evolution of high-risk non-cardiac surgical procedures in Spain

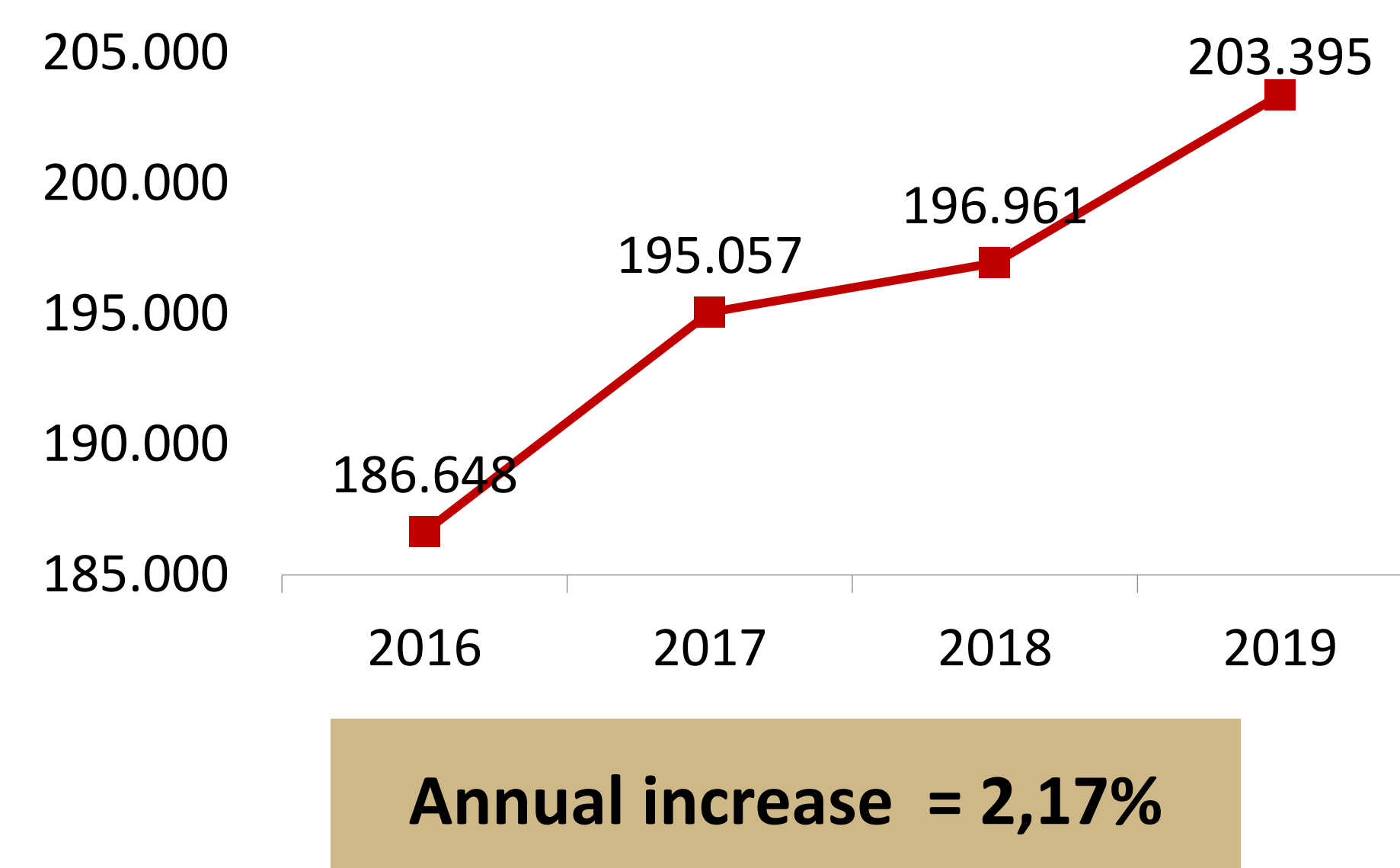


Figure 2. Share of ACOs type in Gregory *et al.* 2021

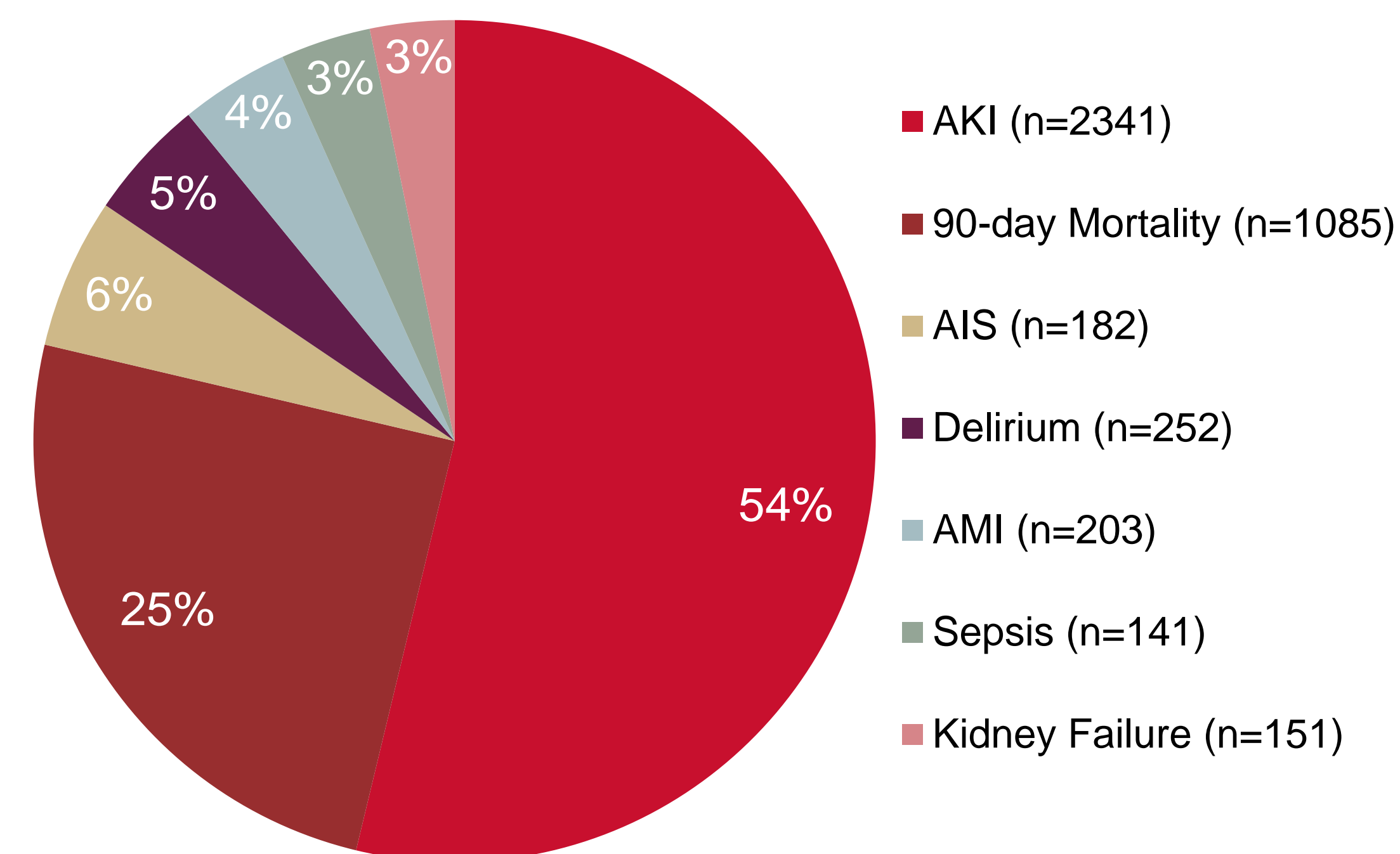


Figure 3. Evolution of number of ACOs and its cost: Gregory *et al.* 2021

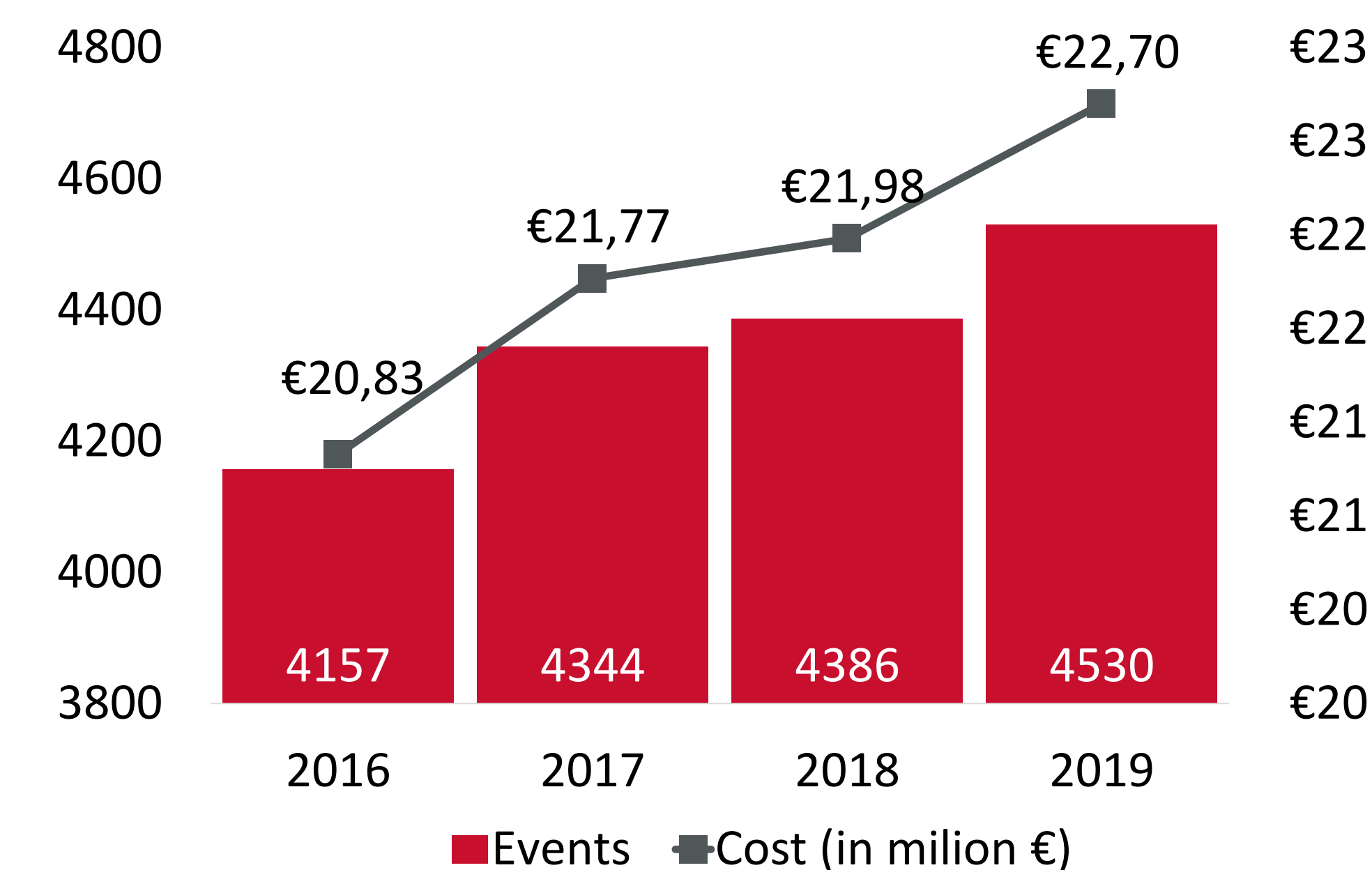
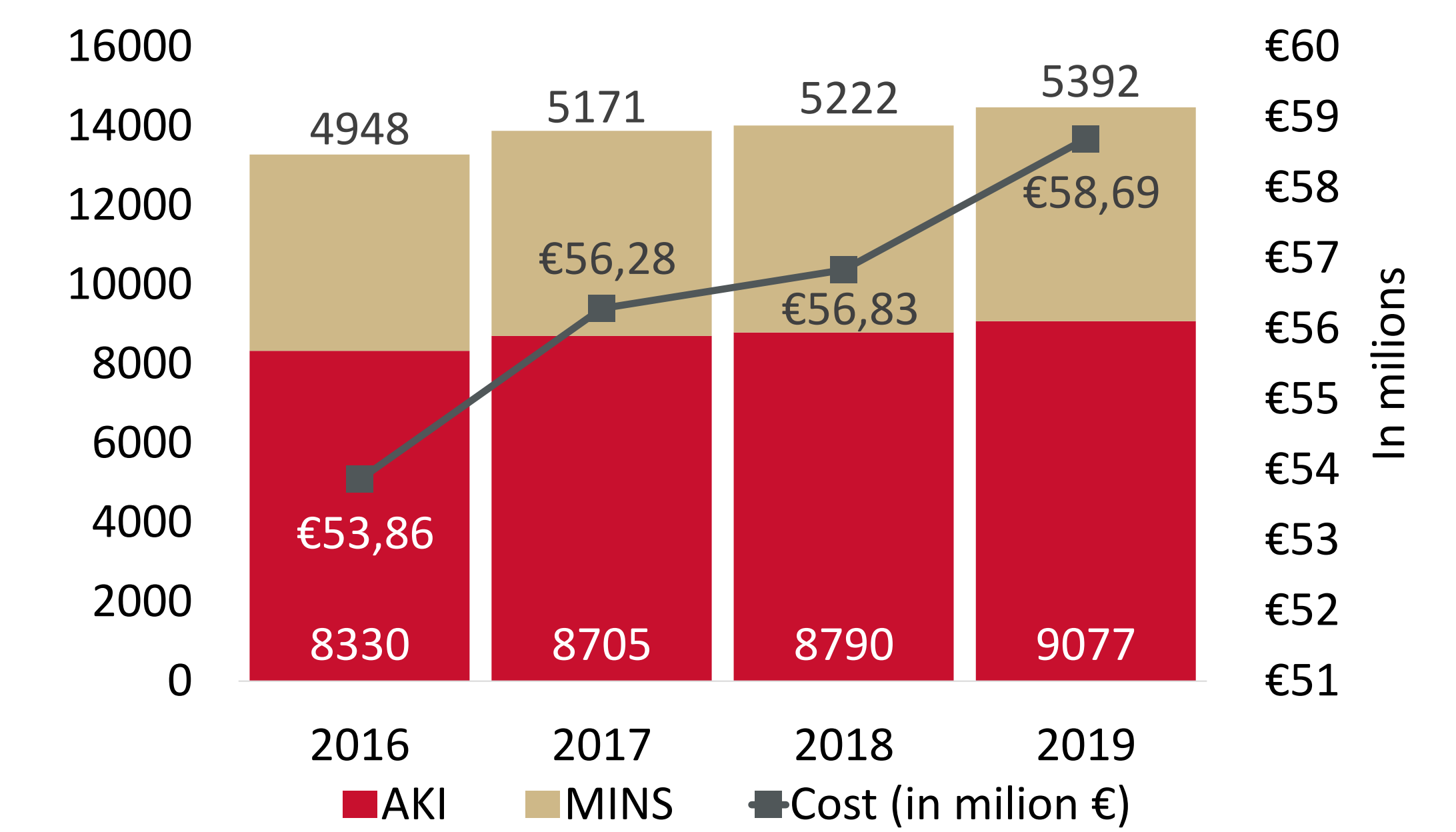


Figure 4. Evolution of number of ACOs and its cost: Salmasi *et al.* 2021



## CONCLUSION:

- Undoubtedly, adverse clinical outcomes associated with IOH in non-cardiac high-risk surgery entail a high economic burden for the Spanish healthcare system with a growing cost, due to the increase of high-risk procedures.
- Even with different scenarios based on previous published research with a different severity profile and set of interventions, the existence of a remarkable IOH-related burden has been highlighted.
- Innovations and protocols focused on the early detection and management of IOH are warranted to minimize IOH impact and the related economical burden.



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<sup>1</sup>Gregory A, Stapelfeldt WH, Khanna AK, et al. Intraoperative Hypotension Is Associated With Adverse Clinical Outcomes After Noncardiac Surgery. *Anesth Analg.* 2021;132(6):1654-1665. doi:10.1213/ANE.0000000000005250

<sup>2</sup>Salmasi V, Maheshwari K, Yang D, et al. Relationship between Intraoperative Hypotension, Defined by Either Reduction from Baseline or Absolute Thresholds, and Acute Kidney and Myocardial Injury after Noncardiac Surgery: A Retrospective Cohort Analysis. *Anesthesiology.* 2017;126(1):47-65. doi:10.1097/ALN.0000000000001432

<sup>3</sup>Ministerio de Sanidad. Subdirección General de Información Sanitaria. Registro de Actividad de Atención Especializada – RAE-CMBD (Accesed June 2021)