

# Oral Anticoagulant Related Intracerebral Hemorrhages and Trends in Sale of Oral Anticoagulants

## Results from the COOL-ICH Study

Grundtvig J. L. G.<sup>1</sup>, Ovesen C.<sup>1</sup>, Steiner T.<sup>2</sup>, Christensen H.<sup>1</sup>, on behalf of the COOL-ICH study group.\*

1. Department of Neurology, Bispebjerg Hospital & University of Copenhagen  
2. Klinikum Frankfurt Höchst, and Heidelberg University Hospital, Germany

### Aim

To describe temporal trends in the incidence of OAC-related ICH and in sale of OAC including VKA and NOAC from 2010 until 2017 in a cohort of consecutive patients from a well-defined geographic population.

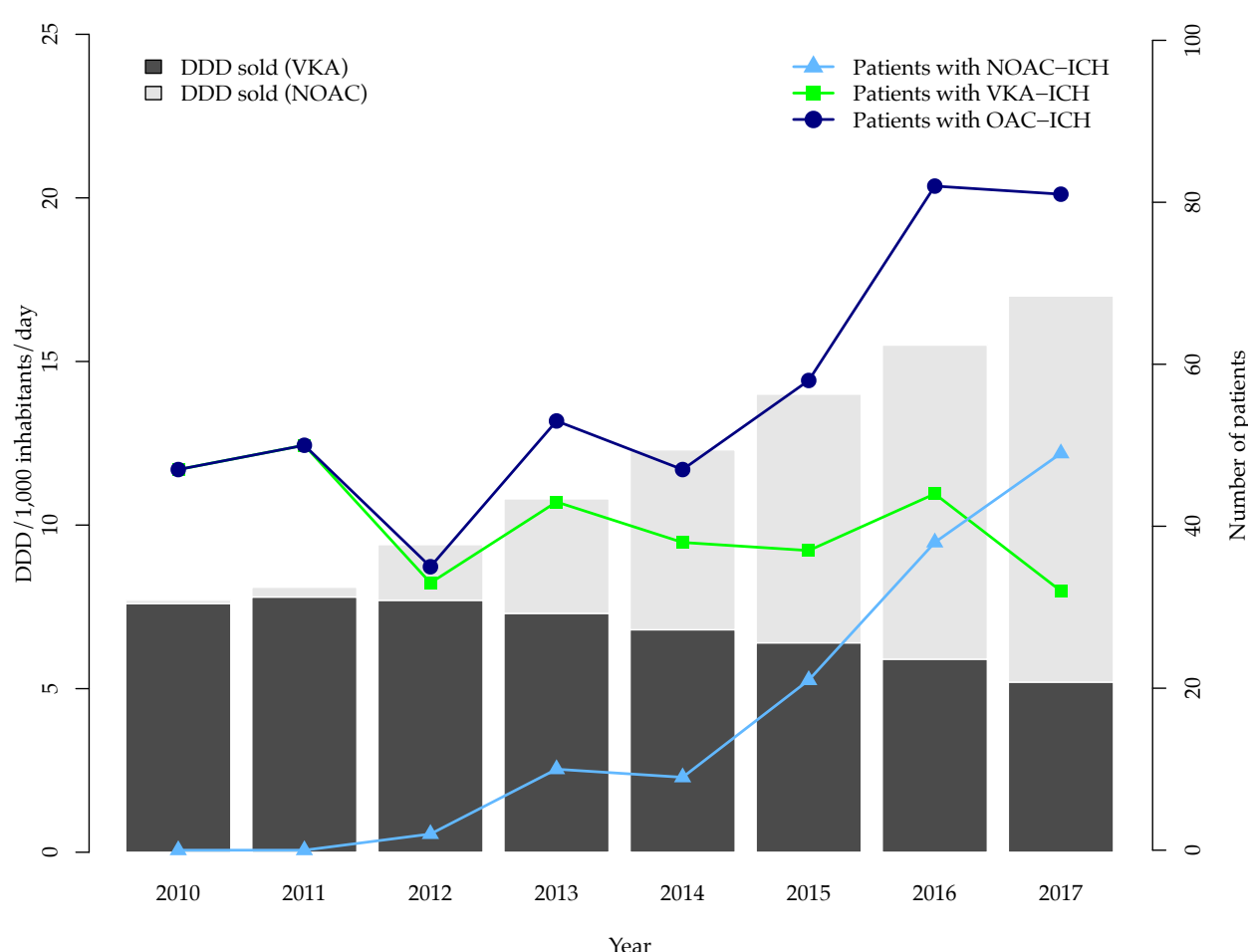
### Methods

COOL-ICH was based on a consecutive cohort including all patients admitted to hospital with OAC-related non-traumatic ICH in the Capital Region of Denmark from January 1st, 2010 until June 1st, 2018. Data on sale of OAC were retrieved through a publicly available website 'Medstat', published by the Danish Health Data Authority. We retrieved data on sold Defined Daily Dosis (DDD) for warfarin, phenprocoumon, dabigatran, rivaroxaban, apixaban and edoxban from 2010 – 2017 in the Capital Region of Denmark. All data analyses, graphs and frequency distributions were made using 'R' version 3.5.1.

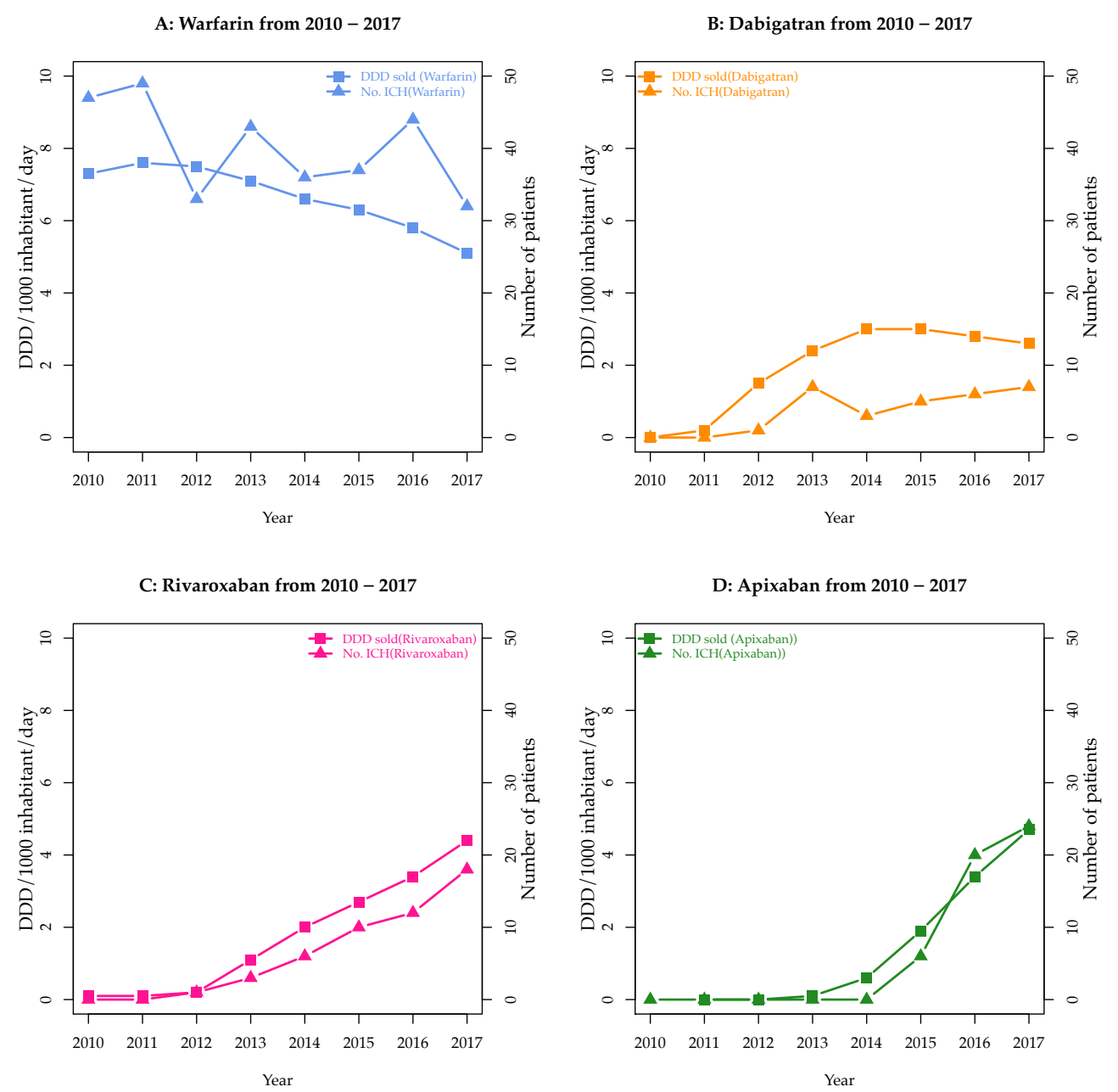
### Results

A total of 453 OAC-related ICH patients were identified (324 VKA-related ICH, 129 NOAC-related ICH). Sale as well as occurrence of NOAC-related ICH has increased, whereas sale of VKA and frequency of VKA-related ICH is decreasing (figure 1). Incidence rate of OAC-related ICH increased from 2.79 to 4.47 ( $p < 0.001$ ) per 100,000 person-years from 2010 to 2017. Trends in sale of specific OACs and frequency of ICH during treatment with specific OACs are presented in figure 2. Figure 3 depicts an unchanged frequency of ICH, with OAC-related ICH increasing from 47 in 2014 to 81 in 2017, corresponding to an increase from 13% to 22% of all ICH from 2010 until 2017 (Cochran-Armitage test for trend:  $p < 0,001$ ).

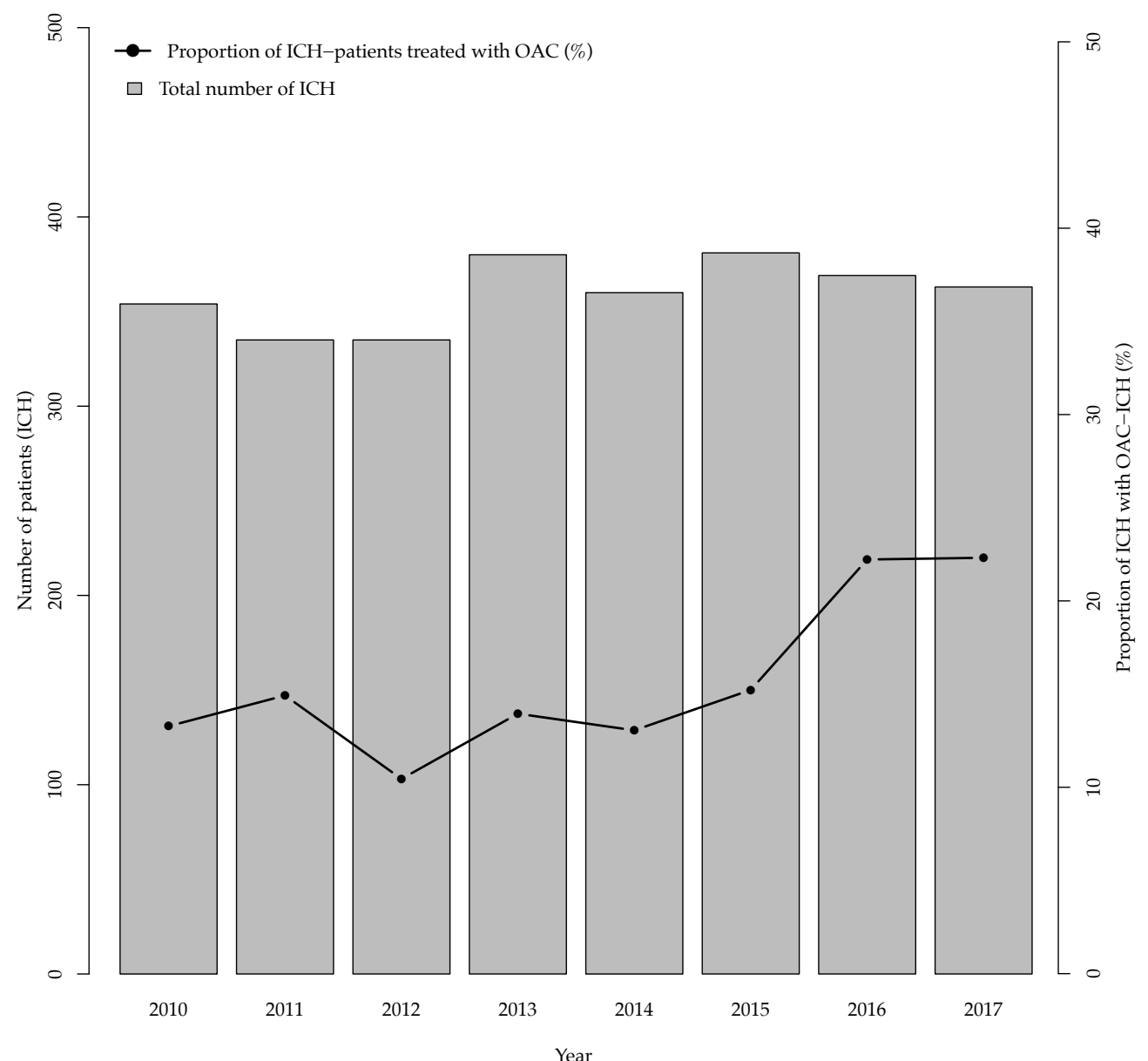
### Figure 1: Sold OAC and OAC-ICH frequency



### Figure 2: Most frequently used OACs



### Figure 3: ICH in the Capital Region of Denmark



### Conclusion

Incidence of OAC-related ICH has increased with 60% during less than 10 years, based on a higher frequency of NOAC-related ICH. NOAC-related ICH is now more frequent than VKA-related ICH in this high-income region.