# The Surgery After Stenting Registry (SAS):

a multicentre registry of consecutive patients undergoing cardiac and non-cardiac surgery or operative endoscopic/endovascular procedures after implantation of a coronary stent

Co-Principal Investigators Roberta Rossini and Stefano Savonitto
On behalf of SAS Investigators and Italian Society of Invasive Cardiology (GISE)

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# Potential conflicts of interest

**Speaker's name: Roberta Rossini**

☑ **I have the following potential conflicts of interest to report:**

Honorarium: ASTRAZENECA, DAIICHI SANKYO, and ELI-LILLY

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# Background I

Surgery represents one of the most common reasons for premature antiplatelet therapy discontinuation, which is associated with a significant increase in mortality and major adverse cardiac events, in particular stent thrombosis.

Optimal perioperative antiplatelet therapy in patients with coronary stents undergoing surgery still remains poorly defined and remains a matter of debate between cardiologists, surgeons, and anesthesiologists.

# Recommendations on peri-operative antiplatelet therapy in patients undergoing non cardiac surgery

| Recommendations | Class[a] | Level[b] |
|---|---|---|
| It is recommended that aspirin be continued for 4 weeks after BMS implantation and for 3–12 months after DES implantation, unless the risk of life-threatening surgical bleeding on aspirin is unacceptably high. | I | C |
| Continuation of aspirin, in patients previously thus treated, may be considered in the peri-operative period, and should be based on an individual decision that depends on the peri-operative bleeding risk, weighed against the risk of thrombotic complications. | IIb | B |
| Discontinuation of aspirin therapy, in patients previously treated with it, should be considered in those in whom haemostasis is anticipated to be difficult to control during surgery. | IIa | B |

| Recommendations | Class[a] | Level[b] |
|---|---|---|
| Continuation of $P2Y_{12}$ inhibitor treatment should be considered for 4 weeks after BMS implantation and for 3–12 months after DES implantation, unless the risk of life-threatening surgical bleeding on this agent is unacceptably high. | IIa | C |
| In patients treated with $P2Y_{12}$ inhibitors, who need to undergo surgery, postponing surgery for at least 5 days after cessation of ticagrelor and clopidogrel—and for 7 days in the case of prasugrel—if clinically feasible, should be considered unless the patient is at high risk of an ischaemic event. | IIa | C |

Eur Heart J. 2014;35:2383-431

# Background II

The Italian Society of Invasive Cardiology (SICI-GISE) and the Italian Association of Hospital Cardiologists (ANMCO) in cooperation with other 17 societies of surgeons and anaesthesiologists have recently published a consensus document. It provides practical recommendations on perioperative management of antiplatelet therapy in patients with coronary stents undergoing surgery defining the optimal antiplatelet regimen in the perioperative phase of the vast majority of surgical procedures.

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# The Expert Consensus Document

EuroIntervention 2014;10:38-46

FOCUS ARTICLE

## Perioperative management of antiplatelet therapy in patients with coronary stents undergoing cardiac and non-cardiac surgery: a consensus document from Italian cardiological, surgical and anaesthesiological societies

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*The authors' affiliations and also the accompanying supplementary data can be found in the online version of this paper at the following website: http://www.pcronline.com/eurointervention/72nd_issue/8*

Rossini et al EuroIntervention. 2014;10:38-46.

# The Consensus Document: Example (General Surgery)

| Surgical risk | | Thrombotic risk: Low risk | Thrombotic risk: Intermediate risk | Thrombotic risk: High risk |
|---|---|---|---|---|
| | **Low risk**<br><br>Hernioplasty, plastic surgery of incisional hernias, cholecystectomy, appendectomy and colectomy, gastric resection, intestinal resection, breast surgery | ASA: continue<br>$P2Y_{12}$ receptor inhibitors:<br>- Discontinue 5 days before<br>- Resume within 24-72 hours, with a loading dose | Elective surgery: postpone<br><br>Non-deferrable surgery:<br>ASA: continue<br>$P2Y_{12}$ receptor inhibitors: continue | Elective surgery: postpone<br><br>Non-deferrable surgery:<br>ASA: continue<br>$P2Y_{12}$ receptor inhibitors: continue |
| | **Intermediate risk**<br><br>Haemorrhoidectomy, splenectomy, gastrectomy, obesity surgery, rectal resection, thyroidectomy | ASA: continue<br>$P2Y_{12}$ receptor inhibitors:<br>- Discontinue 5 days before<br>- Resume within 24-72 hours, with a loading dose | Elective surgery: postpone<br><br>Non-deferrable surgery:<br>ASA: continue<br>$P2Y_{12}$ receptor inhibitors:<br>- Discontinue 5 days before<br>- Resume within 24-72 hours, with a loading dose | Elective surgery: postpone<br><br>Non deferrable surgery:<br>ASA: continue<br>$P2Y_{12}$ receptor inhibitors:<br>-Discontinue 5 days before<br>-Resume within 24-72 hours, with a loading dose<br>Bridge therapy with GPI |
| | **High risk**<br><br>Hepatic resection, duodeno-cefalopancreasectomy | ASA: continue<br>$P2Y_{12}$ receptor inhibitors:<br>- Discontinue 5 days before<br>- Resume within 24-72 hours, with a loading dose | Elective surgery: postpone<br><br>Non-deferrable surgery:<br>ASA: continue<br>$P2Y_{12}$ receptor inhibitors:<br>- Discontinue 5 days before<br>- Resume within 24-72 hours, with a loading dose | Elective surgery: postpone<br><br>Non deferrable surgery:<br>ASA: continue<br>$P2Y_{12}$ receptor inhibitors:<br>-Discontinue 5 days before<br>-Resume within 24-72 hours, with a loading dose<br>Bridge therapy with GPI |

The cardiologist defines the ischemic risk

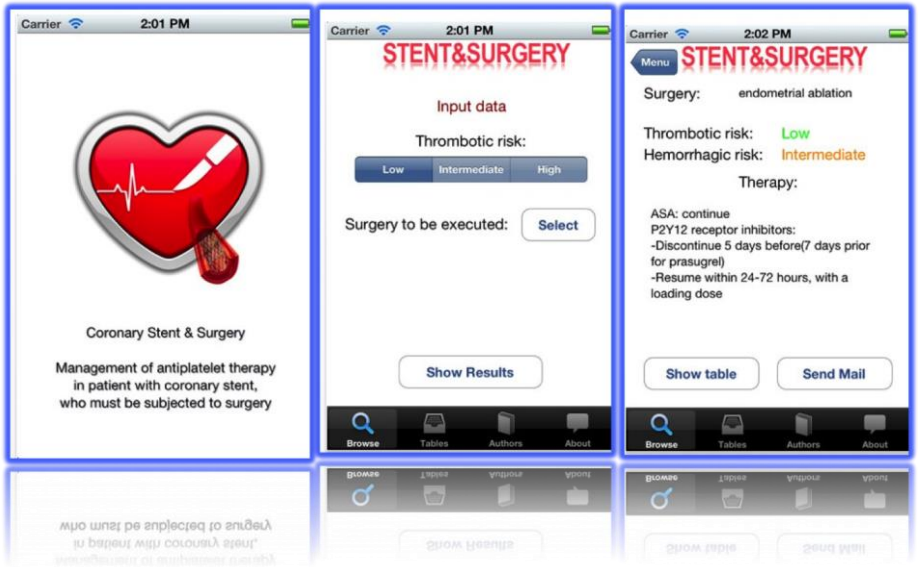
The surgeon defines the bleeding risk

Rossini et al EuroIntervention. 2014;10:38-46.

# Consensus Document Key points

- Maintain aspirin in the vast majority of patients
- Postpone surgery, whenever possible, in patients at high/intermediate thrombotic risk
- Discontinue $P2Y_{12}$ inhibitor in selected patients after 6 month in low-risk PCI undergoing high hemorrhagic risk surgery
- Use bridge therapy with GPI in high thrombotic risk patients undergoing high hemorrhagic risk surgery

"Stent and Surgery"
iOS-Android Application
https://itunes.apple.com/us/app/stent-surgery/id551350096?mt=8



# Aim and Methods

- To define the impact of complying with these recommendations on clinical outcomes in patients with coronary stents undergoing cardiac and non-cardiac surgery.
- Multicenter, prospective, national observational registry of consecutive patients with prior coronary stenting undergoing any type of surgery at 19 centers in Italy (NCT01997242). The study was promoted by the Italian Society of Invasive Cardiology (GISE)

Società Italiana
di Cardiologia Invasiva

# Study End-points

- **Primary end-points**:
  - Composite of death, myocardial infarction (MI), probable/definite stent thrombosis and Bleeding Academic Research Consortium (BARC) grade ≥3 bleeding during the index surgical admission
- **Secondary Endpoints:**
  - Composite of death, myocardial infarction and probable/definite stent thrombosis within 30 days of index surgical admission/procedure
  - Bleeding Academic Research Consortium (BARC) grade ≥3 bleeding within 30 days of index surgical admission/procedure

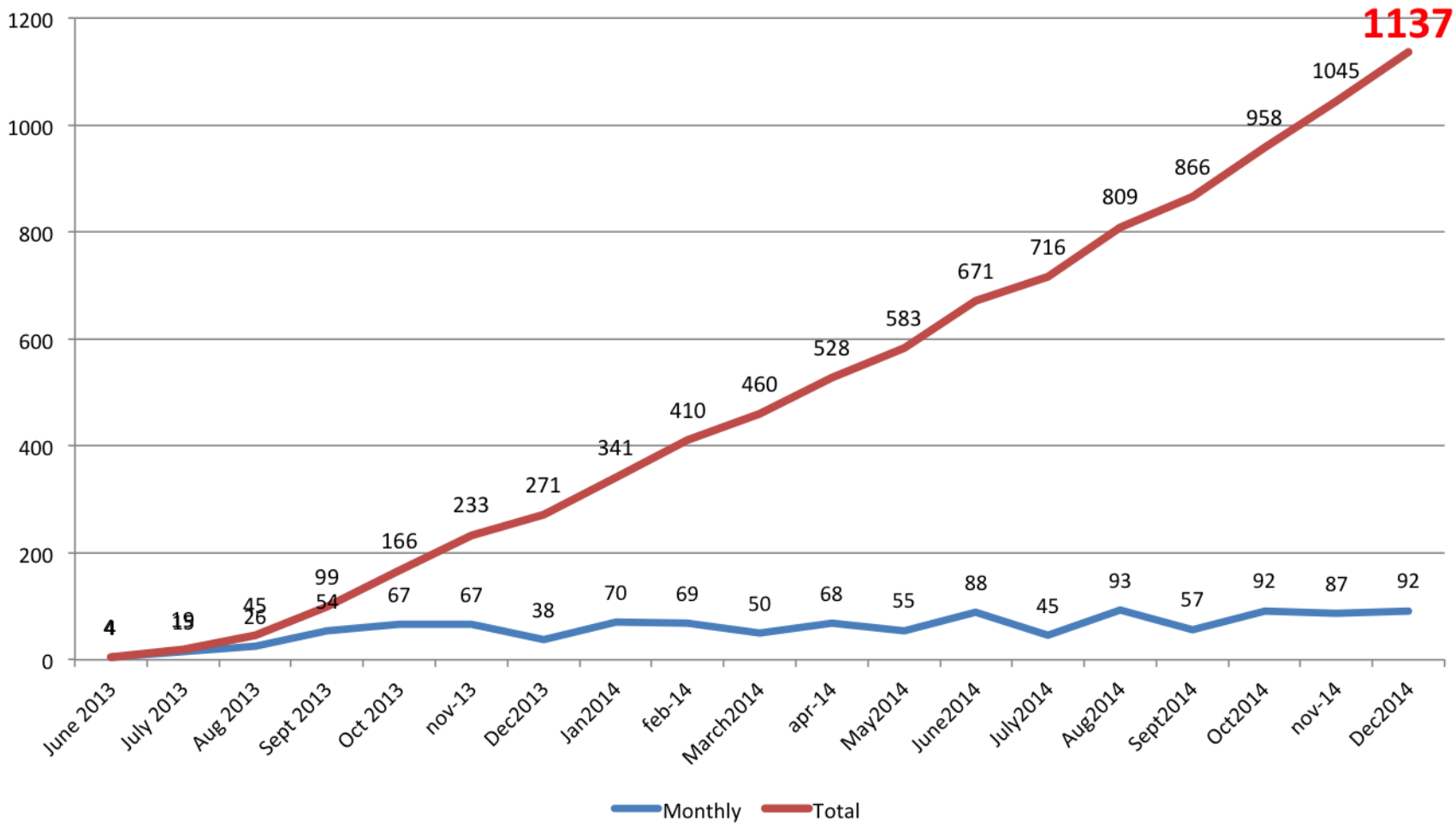
# Inclusion criteria

- Male and female patients > 18 years of age.
- Patients with previous coronary stenting undergoing any kind of surgical or operative endoscopic procedure at the participating Centers, irrespective of the distance in time between stenting and surgery
- Both candidates to elective/urgent operations and those undergoing emergency procedures

# Exclusion criteria

- Unwilligness/inability to sign the Informed Consent Form
- There are no other selection criteria

# SAS enrolment curve




55 patients did not undergo any surgical procedure after providing consent: a total of **1082 patients were available for analysis**. There were no lost to follow-up at 30 days.

*The SAS Registry*

# Baseline Demographics and Clinical Characteristics and PCI Details

| Variable | Value |
|---|---|
| Age, years±SD | 71±9 |
| Age >75 years, n (%) | 379 (35.7) |
| Female, n (%) | 192 (18.1) |
| BMI, Kg/m$^2$±SD | 27±14 |
| Diabetes | 349 (33.0) |
| Acute coronary syndrome at PCI | 644 (64.5) |

| PCI details | Value |
|---|---|
| Number of treated lesions at index PCI, n±SD | 1.4±0.6 |
| Bifurcation lesion, n (%) | 92 (9.9) |
| Number of implanted stents at index PCI, n±SD | 1.6±0.9 |
| Total stent length, mm±SD | 31±21 |
| DES, n (%) | 578 (63.6) |
| Second generation DES, n (%) | 352 (45.2) |

**The recommendations provided in the consensus document were followed in 85% of the surgeries.** In the remaining 15%, the main reason for lack of adherence to the document was mostly attributed to the treating physician’s perception of patients having a hemorrhagic or thrombotic risk too high.

# Details of surgical procedures

- Cardiac surgery n 202 (18.6%)
- Urology n. 182 (16,8%)
- Vascular surgery n. 178 (16.5%)
- General surgery n. 165 (15.3%)
- Othopedics n. 106 (9.8%)
- Digestive endoscopy n. 55 (5.1%)
- Other n. 194 (17.9%)

- Surgery <180 days from PCI, n. 116 (14.1%)
- Intermediate to high surgical bleeding risk, n. 558 (51.6%)

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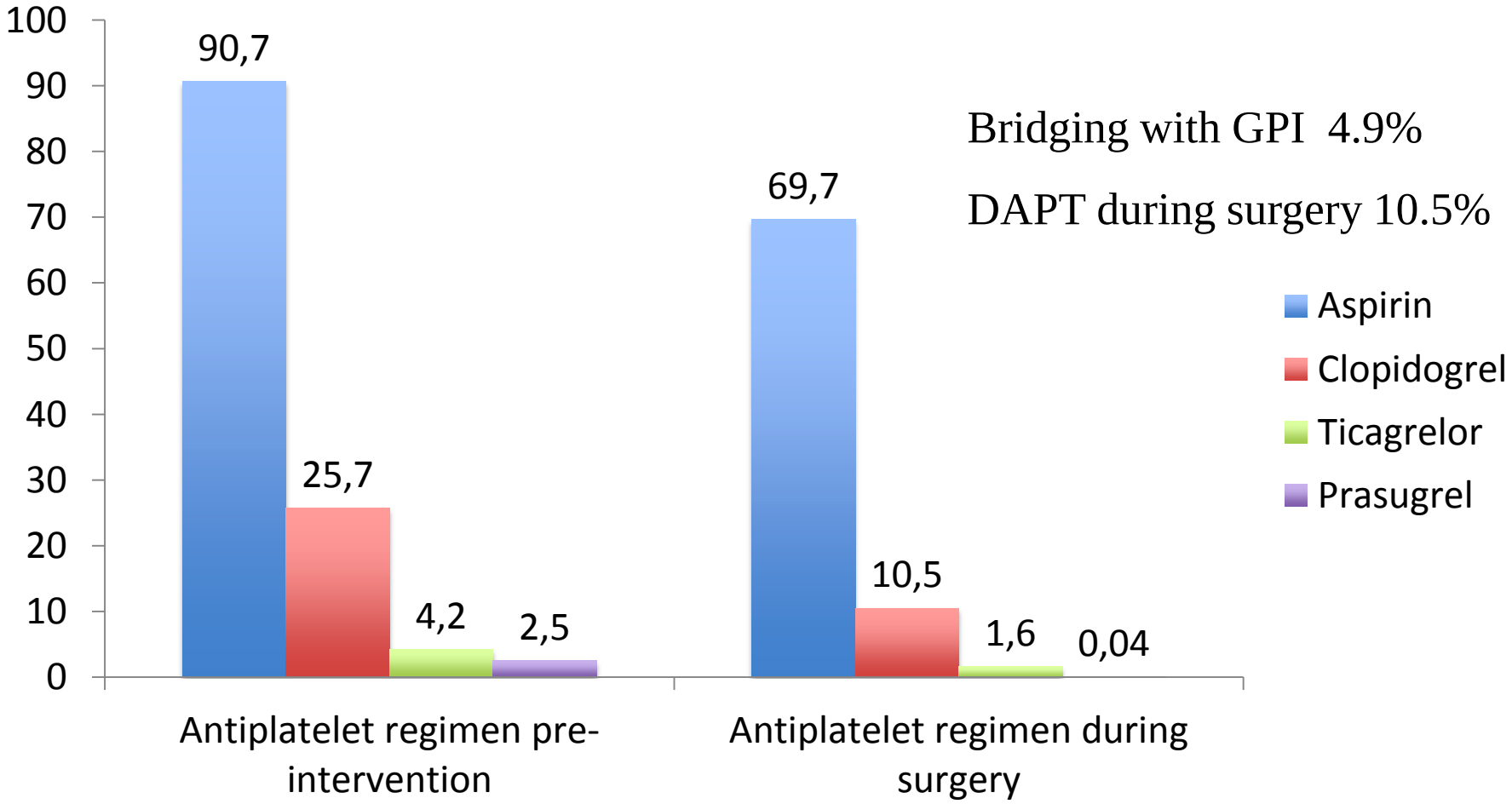
# Details of Antithrombotic Therapy at the Time of Surgery or Invasive Procedure




Bridging with GPI 4.9%

DAPT during surgery 10.5%

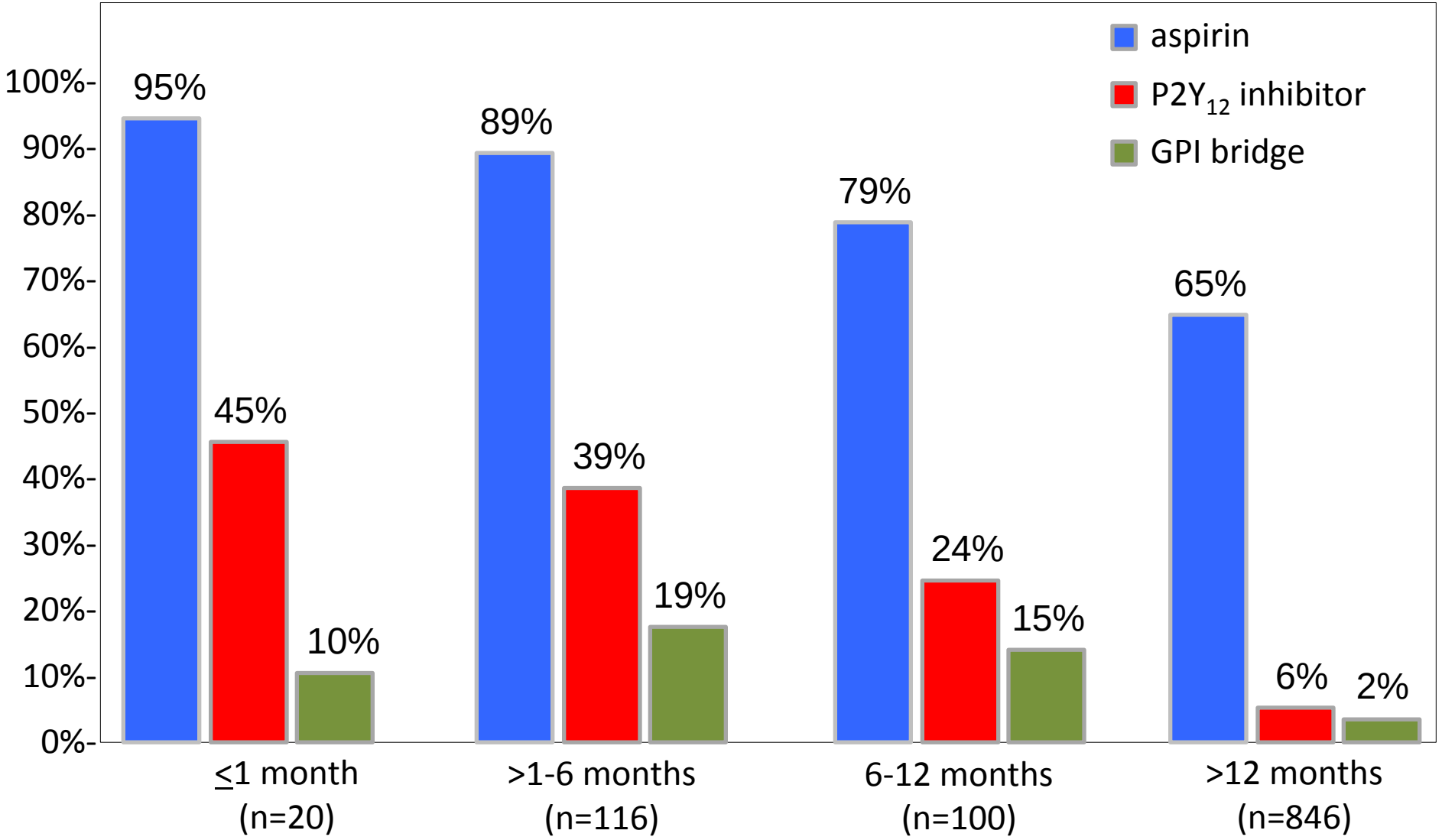
Stopped ASA pre interv. 23,1%

Length of discontinuation 11±9 days

Stopped P2Y12 pre interv. 63.5%

Length of discontinuation 10±7 days

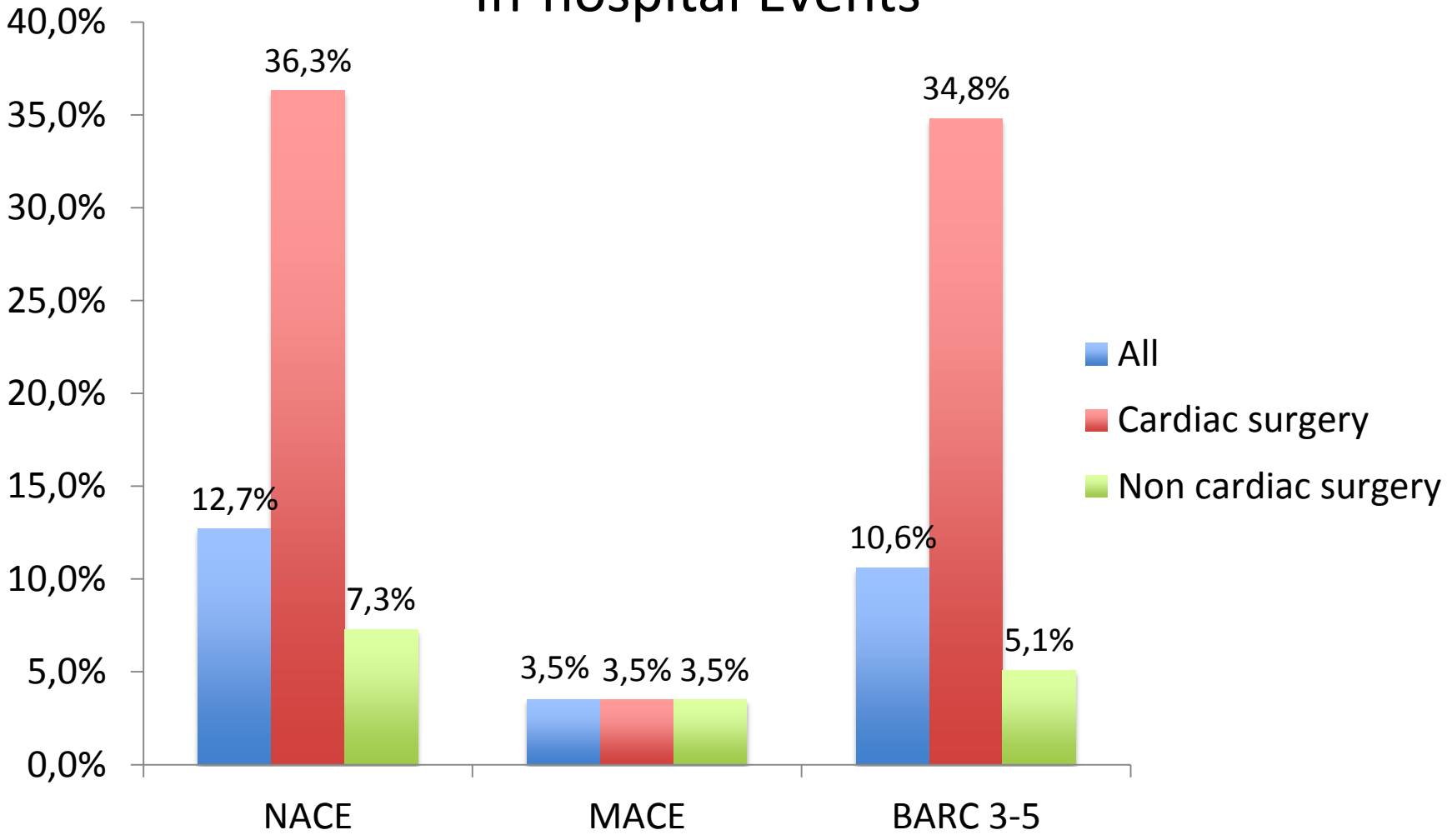
# Perioperative antiplatelet drugs based on time interval from stenting to surgery



**Primary endpoint**

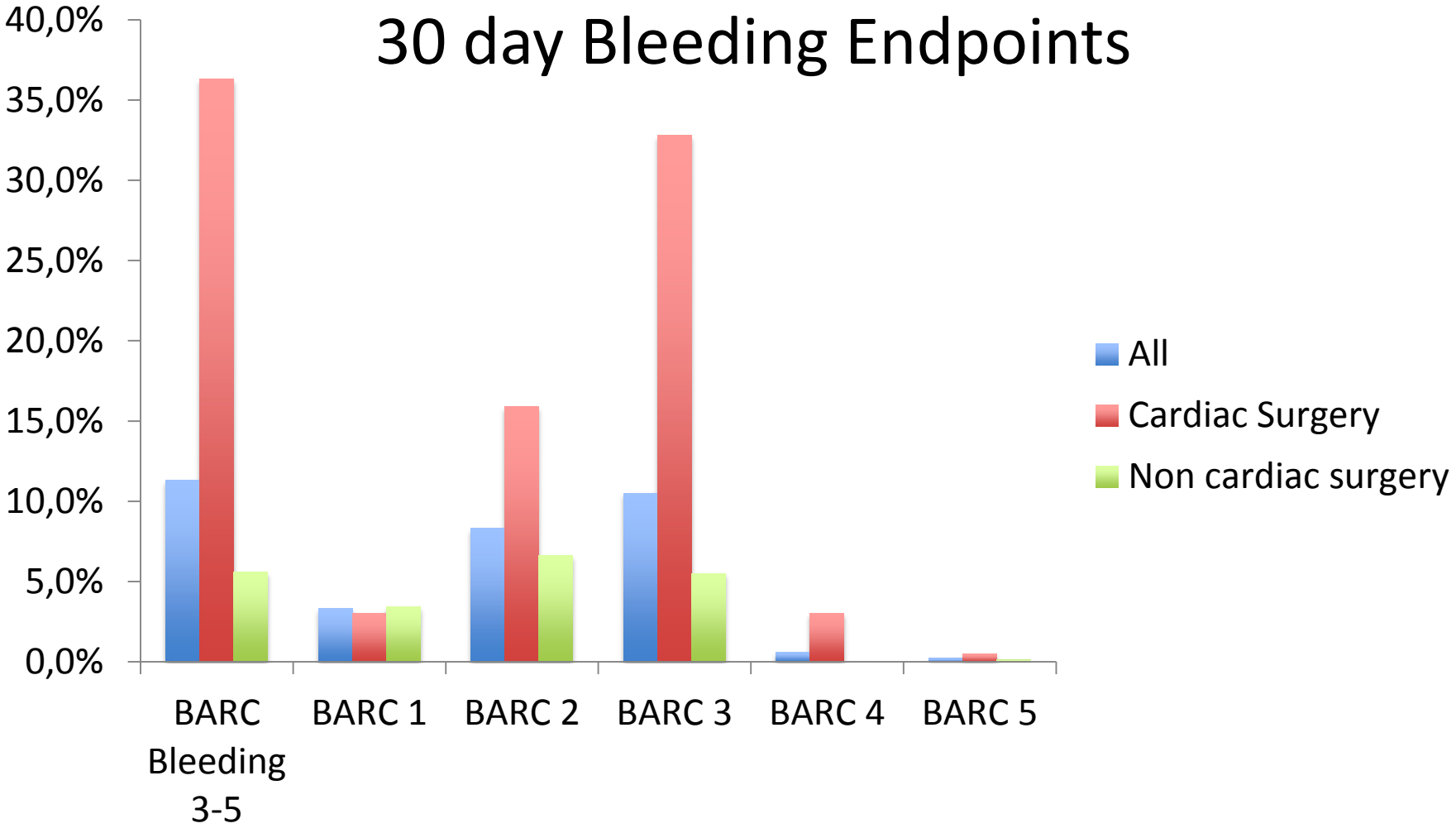
# Outcome Events after Surgery or Invasive Procedure

## In-hospital Events



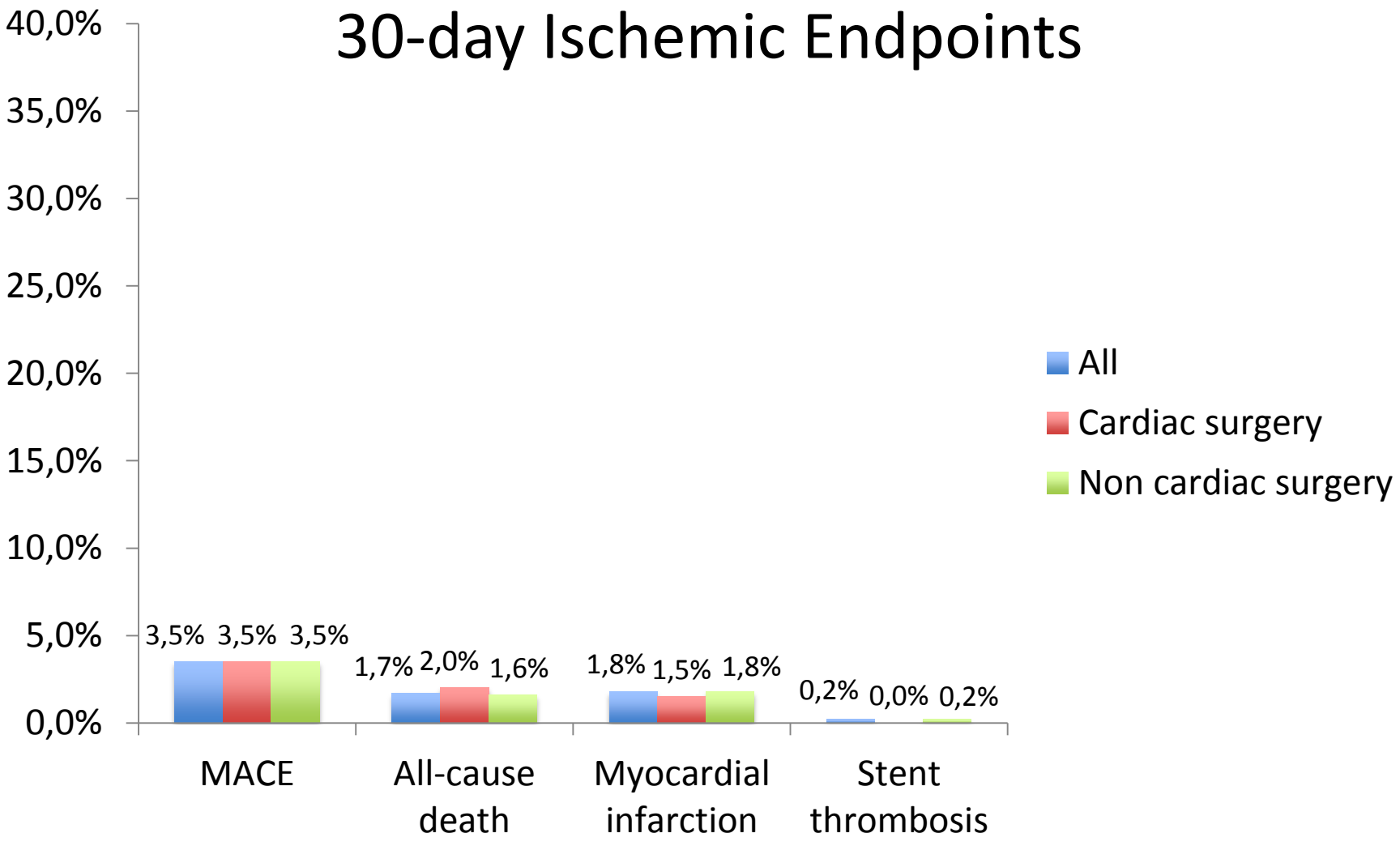
**Secondary endpoint**

# Outcome Events after Surgery or Invasive Procedure



**Secondary endpoint**

# Outcome Events after Surgery or Invasive Procedure



# Independent predictors of in-hospital NACE

| Variable | Univariate OR (95% CI); P value | Multivariate OR (95% CI); P value | Multivariate (Cardiac surgery) | Multivariate (Noncardiac surgery) |
|---|---|---|---|---|
| BMI | 1.00 (1.00-1.02); 0.18 | - | - | - |
| **Prior cerebrovascular accident** | **1.50 (0.90-2.50); 0.12** | **2.56 (1.27-5.17); <0.01** | - | 4.15 (1.90-9.07); <0.01 |
| Malignancies | 0.73 (0.47-1.14); 0.17 | - | - | - |
| Acute coronary syndromes | 0.41 (0.28-0.60); <0.01 | - | 0.37 (0.16-0.89); 0.03 | - |
| DES | 0.74 (0.51-1.09); 0.12 | - | - | - |
| Second generation DES | 0.83 (0.55-1.24); 0.35 | - | - | - |
| **Cardiac surgery** | **7.27 (4.96-10.7); <0.01** | **4.76 (2.58-8.78); <0.01** | NA | NA |
| **Surgery <180 days from PCI** | **1.81 (1.08-3.04); 0.03** | **1.99 (1.02-3.90); 0.04** | - | 4.61 (2.03-10.48); 0.01 |
| **Intermediate to high bleeding risk*** | **5.29 (3.34-8.37); <0.01** | **3.24 (1.68-6.26); <0.01** | - | 3.36 (1.69-6.70); <0.01 |
| On $P2Y_{12}$ inhibitor pre intervention | 0.72 (0.48-1.05); 0.09 | 0.36 (0.20-0.65); 0.01 | 0.35 (0.15-0.84); 0.02 | 0.36 (0.16-0.79); 0.01 |
| Aspirin during surgery | 2.80 (1.71-4.59); <0.01 | - | - | - |

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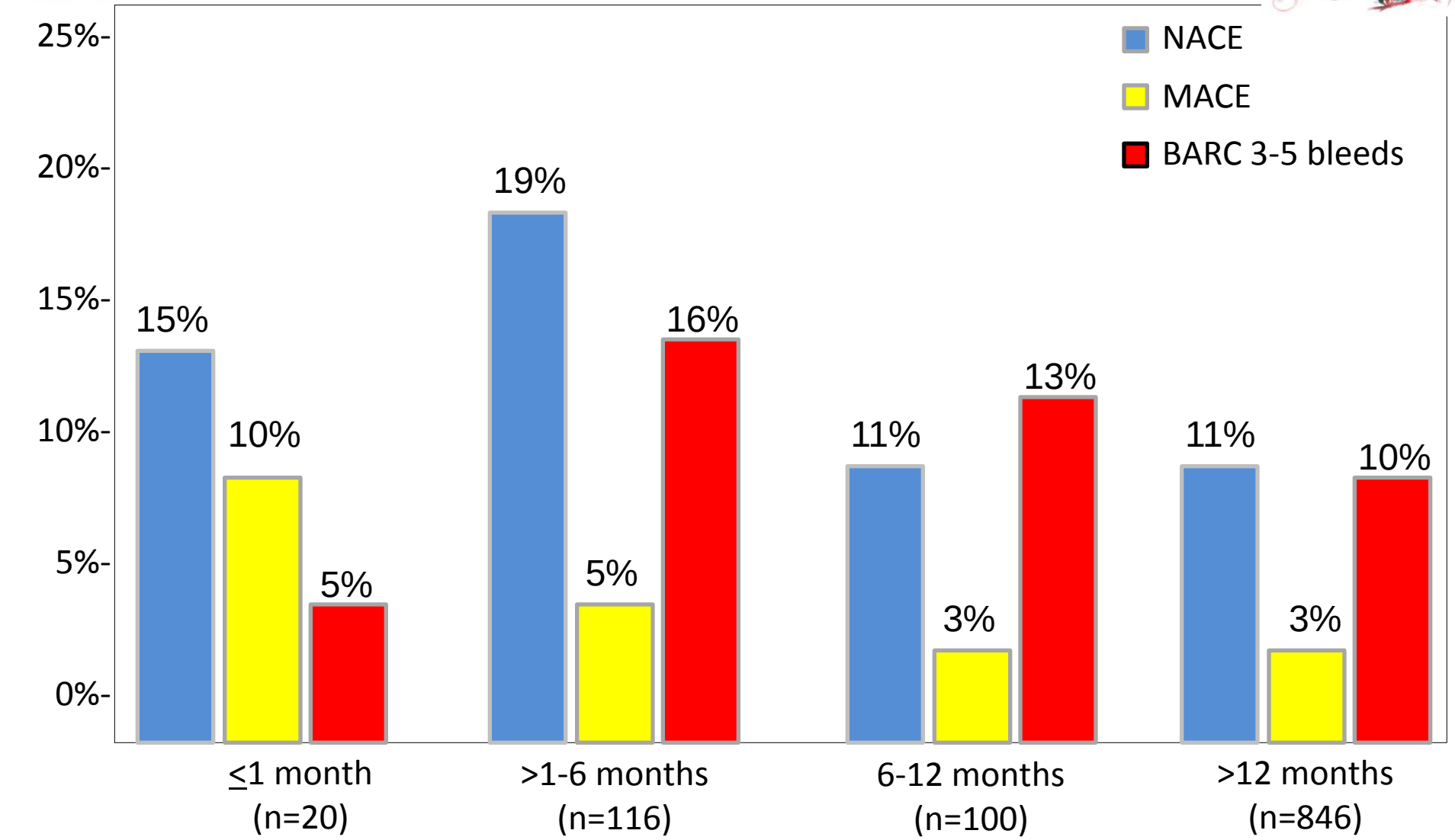
# Independent predictors of MACE at 30 days

| Variable | Univariate OR (95% CI); P value | Multivariate OR (95% CI); P value | Multivariate (Cardiac surgery) | Multivariate (Noncardiac surgery) |
|---|---|---|---|---|
| Age, years±SD | 1.04 (1.00-1.08); 0.06 | - | - | 3.42 (1.15-10.15); 0.03 |
| Age >75 years | 2.06 (1.08-3.95); 0.029 | - | - | - |
| BMI <18.5 | 3.90 (0.85-17.81); 0.08 | - | - | 14.68 (1.18-182); 0.04 |
| Hypertension | 2.49 (0.76-8.20); 0.13 | - | - | - |
| Prior CABG | 2.04 (0.94-4.40); 0.07 | - | - | - |
| Acute coronary syndromes | 0.57 (0.30-1.00); 0.09 | - | - | - |
| Number of treated lesions at index PCI | 0.43 (0.19-0.97); 0.04 | 0.13 (0.02-0.98); 0.048 | - | - |
| Total stent length | 1.02 (1.01-1.03); <0.01 | 1.02 (1.00-1.04); 0.02 | - | 1.03 (1.01-1.05); <0.01 |
| General surgery | 2.05 (0.97-4.30); 0.06 | - | - | - |
| On $P2Y_{12}$ inhibitor pre intervention | 0.52 (0.24-1.12); 0.10 | - | - | - |
| $P2Y_{12}$ inhibitor during surgery | 0.35 (0.08-1.47); 0.15 | - | - | - |
| DAPT during surgery | 0.23 (0.03-1.69); 0.15 | - | - | - |

# Independent predictors of BARC 3-5 at 30 days

| Variable | Univariate OR (95% CI); P value | Multivariate OR (95% CI); P value | Multivariate (Cardiac surgery) | Multivariate (Noncardiac surgery) |
|---|---|---|---|---|
| BMI | 1.01 (1.00-1.02); 0.14 | - | - | - |
| Diabetes | 0.70 (0.45-1.06); 0.09 | - | - | - |
| Chronic kidney disease | 1.44 (0.89-2.36); 0.14 | - | - | - |
| Malignancies | 0.51 (0.31-0.85); 0.01 | - | - | - |
| Acute coronary syndromes | 0.39 (0.26-0.57); <0.01 | - | - | - |
| Total stent length | 0.98 (0.96-1.00); 0.03 | - | - | - |
| Cardiac surgery | 9.67 (6.44-14.53); <0.01 | 5.76 (2.66-12.48) <0.01 | NA | NA |
| Surgery <180 days from PCI | 1.55 (0.89-2.71); 0.12 | - | - | - |
| Intermediate to high bleeding risk* | 6.91 (4.08-11.72); <0.01 | 4.05 (1.39-11.77); 0.01 | | 3.66 (1.25-10.76); 0.02 |
| Aspirin during surgery | 3.19 (1.85-5.50); <0.01 | 2.79 (1.01-7.73); 0.048 | - | - |

# Adverse events
# based on time interval from stenting to surgery



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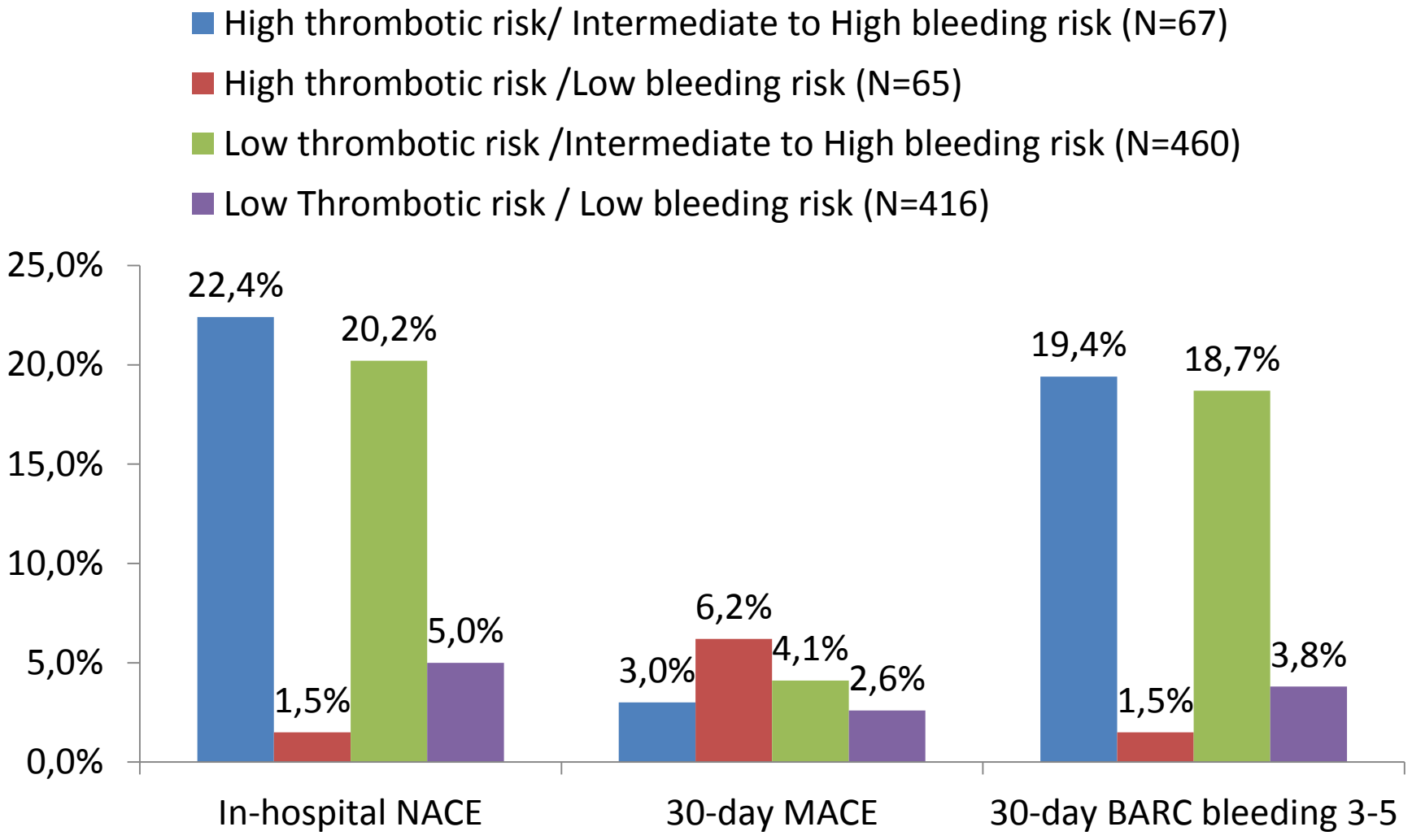
# Adverse events based on bleeding and thrombotic risk



# Conclusions

The results of this registry demonstrate the feasibility of applying Italian consensus document on peroperative management of antiplatelet therapy in patients undergoing surgery.

The very low rate of ischemic and bleeding complications support the safety of the provided recommendations.

# The SAS Registry

| Center | Investigators | N. patients |
|---|---|---|
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| AO Papa Giovanni XXIII, Bergamo | Roberta Rossini, Giuseppe Musumeci, Elona Collaku, Paolo Canova | 128 |
| Azienda Ospedaliera Brotzu, Cagliari | Giampaolo Scorcu | 64 |
| Ospedale della Misericordia, Grosseto | Ugo Limbruno, Paolo Calabria | 59 |
| Ospedale Carlo Poma, Mantova | Corrado Lettieri | 46 |
| Ospedale Niguarda, Milano | Paola Colombo, Giuseppe Bruschi, Matteo Baroni | 52 |
| Ospedale Sacco, Milano | Emanuela Piccaluga | 43 |
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| Ospedale San Gerardo, Monza | Ivan Calchera | 35 |
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