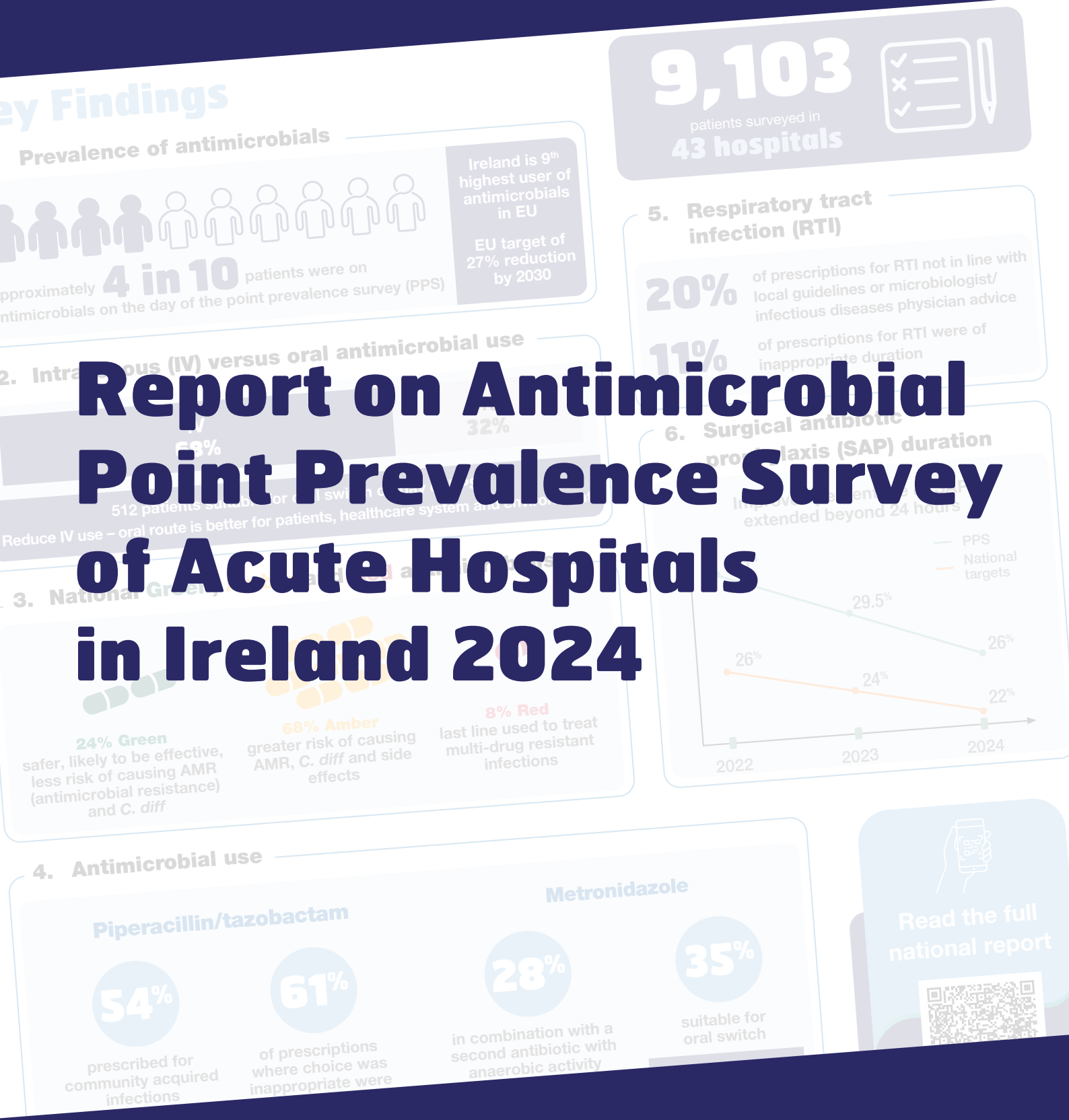
Report on Antimicrobial Point Prevalence Survey of Acute Hospitals in Ireland 2024

National Results



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Key recommendations

1. **Use Green antimicrobials where appropriate**
   - Promote use of Green antimicrobials in preference to Amber and Red antimicrobials where appropriate as per AMRIC Reserve Antimicrobial Policy
2. **Promote timely review of antimicrobials**
   - Promote timely review and stopping or de-escalation of antimicrobial agents using tools such as Start Smart, then Focus
3. **Review intravenous (IV) antimicrobial prescriptions at 24-48 hours**
   - Promote antimicrobial review of IV antimicrobials at 24-48 hours after starting, with view to stopping or changing antimicrobial therapy as clinically indicated
   - Reduce unnecessary use of metronidazole in cases of double anaerobic cover
   - Promote oral use of antimicrobials, in particular agents of excellent oral bioavailability, such as metronidazole
   - Promote IV to oral switch as per AMRIC IV to oral switch toolkit
4. **Focus AMS efforts on treatment of respiratory tract infections**
   - Promote adherence of choice and duration of antimicrobial treatment with local antimicrobial prescribing guidelines
5. **Minimise surgical antibiotic prophylaxis duration**
   - Continue to reduce surgical antibiotic prophylaxis extended beyond 24 hours.
   - Most procedures only require a single dose as per HSE/NCPS National Position Statement.

Executive Summary

The 2024 national antimicrobial point prevalence survey (PPS) of acute hospitals surveyed 9,103 patients in 43 hospitals across Ireland to collect information related to inpatient antimicrobial prescribing. The period for data collection for the 2024 acute hospital PPS was 12/09/24 to 09/10/24.

The overall national prevalence of hospital antimicrobial use in 2024 was 40.9%. A total of 4,935 antimicrobial prescriptions were recorded during this PPS, of which 3,357 were given intravenously (68.0%). Antimicrobials were analysed according to the AMRIC Green Amber Red categorisation system, a new national classification that aligns with the HSE Reserve Antimicrobial Policy, published in December 2024. 24.3% were classified as Green, 68.1% as Amber and 7.6% as Red.

The top five most prescribed agents were (in order of proportion of total antimicrobials prescribed) amoxicillin/clavulanic acid (18.7%), piperacillin/tazobactam (17.8%), cefuroxime (7.1%), metronidazole (5.7%), and flucloxacillin (4.2%).

The survey found that 87.0% of antimicrobial prescriptions were of appropriate duration and, for 84.5% of antimicrobials, their choice was in line with local guidelines or microbiologist/ infectious diseases physician advice. The majority (74.1%) of antimicrobials remained unchanged for the infection episode at the time of the 2024 acute hospital PPS.

The proportion of all IV therapies suitable for oral switch as per local guidelines was 16.6%. It was found that 27.6% of metronidazole prescriptions were combined with a second antibiotic with anaerobic activity, while 34.9% of metronidazole prescriptions were suitable for oral switch.

Over half of prescriptions for piperacillin/tazobactam were for community acquired infections. The most common diagnostic sites where choice of piperacillin/tazobactam was reported to be non-compliant were respiratory tract infections (bronchitis and pneumonia, 61.1% combined).

For 20.3% of all antimicrobial prescriptions for respiratory tract infections (pneumonia and bronchitis) choice of agent was not in line with local guidelines or microbiologist/ infectious diseases physician advice and for 10.7% duration was considered inappropriate.

A decreasing trend in the number of therapies prescribed for surgical antibiotic prophylaxis that were extended beyond 24 hours was noted over the last number of years (26.0% in 2024).

Participants in the 2024 national acute hospital antimicrobial PPS rated the median usefulness of the data collected to the hospital AMS programme at 8 out of 10 where a score of 1 represented not at all useful and 10 represented highly useful.

1. Introduction

The aim of a hospital antimicrobial point prevalence survey (PPS) is to collect information related to antimicrobial prescribing for all inpatients over a defined period (usually one day) to allow assessment of quality improvement work and to inform the development of antimicrobial stewardship action plans.

Since 2009 the annual national antimicrobial PPS has been completed in acute hospitals in Ireland, with data submitted to the Health Protection Surveillance Centre (HPSC) for analysis. From 2009 – 2020 the PPS was coordinated by the Irish Antimicrobial Pharmacists Group (IAPG). From 2021 the PPS was coordinated by the HSE National Antimicrobial Resistance & Infection Control (AMRIC) team, with the analysis being performed by the HSE National AMRIC team from 2022 onwards.

The period for data collection for the 2024 acute hospital PPS was 12/09/24 to 09/10/24. Several refinements were made to the data collection criteria in 2024, following a review by the national acute hospital PPS review group. This included the removal of one collection criterion (planned review or duration documented), the addition of two new questions focussing on change of antimicrobial and oral route of administration, and modifications made to the general questions section. Improvements and wording changes were also made to the protocol and data collection tool, including a modification that allowed for capture of surgical category and operative procedure for all surgical antibiotic prophylaxis. The surgical categories and operative procedures were updated to align to PPS HCAI & Antimicrobial Use in European Acute Care Hospitals. A modification was made to collection criterion 3g to prompt data collectors to record confirmed/suspected infection diagnosed pre-op/intra-op/post-op as treatment indication code rather than surgical antibiotic prophylaxis duration extended beyond 24 hours (SP3).

The 2024 acute hospital PPS patient data collection form is available in Appendix A1.1. This report and previous national PPS reports are available on the Hospital related guidelines page on antibioticprescribing.ie.

2. Results

2.1. General results

- Forty-three hospitals participated in the 2024 national acute hospital antimicrobial PPS.
- The total number of patients included in the 2024 acute hospital PPS was 9,103, of which 3,728 were on antimicrobials (40.9%). This represents an increased proportion of patients on antimicrobials compared to previous years. (Figure 2.1).

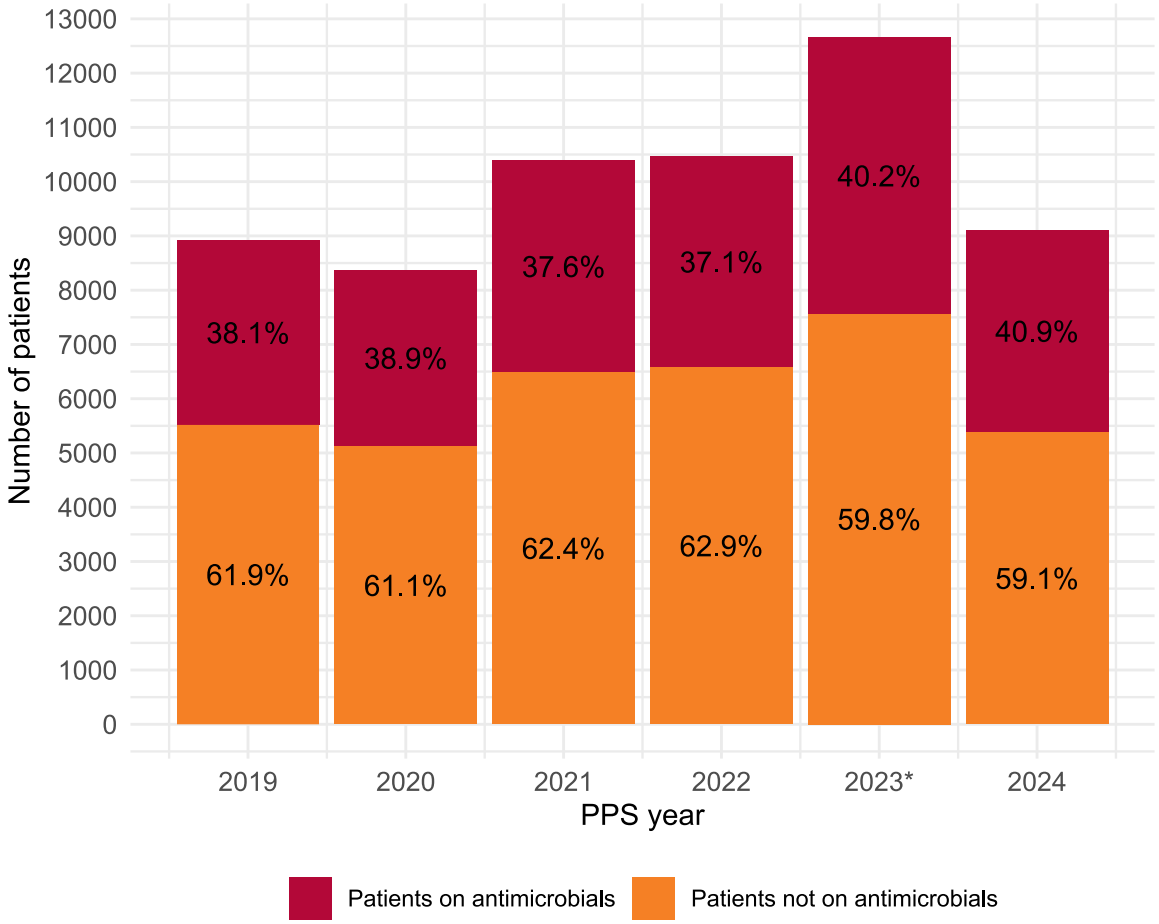

*Figure 2.1: Proportion of patients on antimicrobials over time. *2023 results taken from ECDC PPS 2023.*

- A total of 4,935 antimicrobial prescriptions were recorded during 2024 acute hospital PPS, of which 3,357 were given intravenously (IV) (68.0%). This is a decrease from 69.9% IV recorded in the ECDC PPS 2023[1] (Figure 2.2).
- The number of antimicrobials per patients remained at 1.32, which is the same as recorded in 2023. There has been a downward trend since 2019 (Figure 2.3).

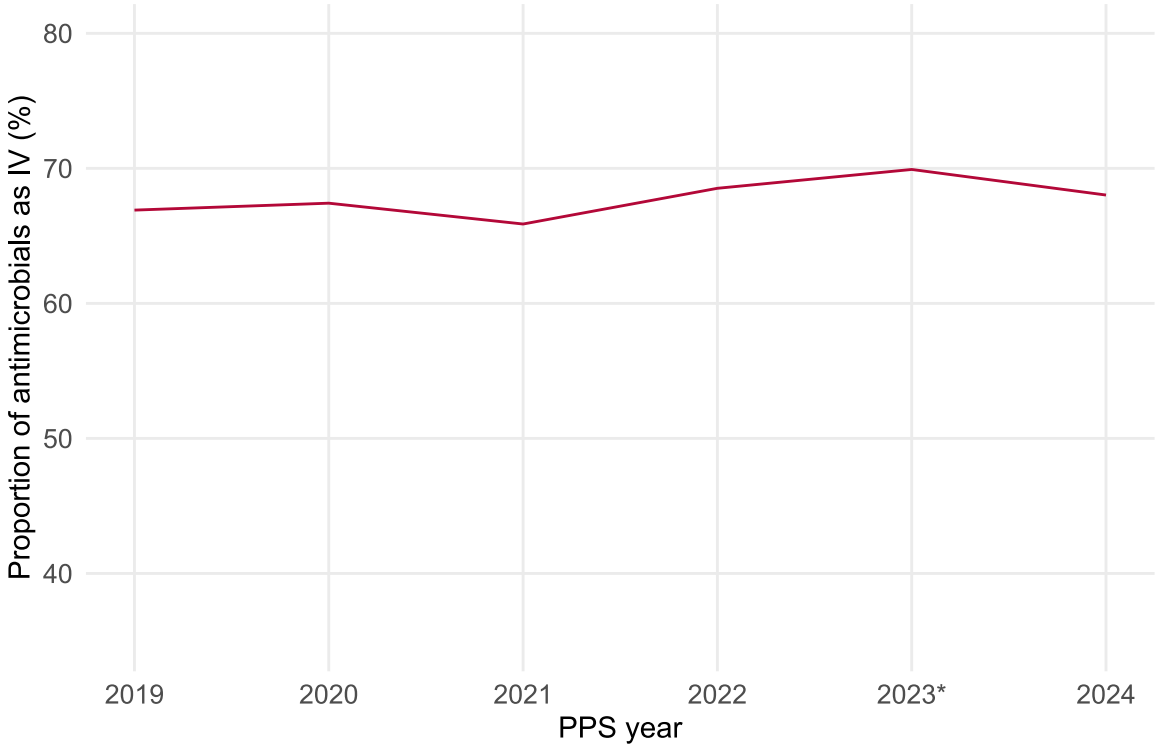

*Figure 2.2: Proportion of antimicrobials administered as IV, over time. *2023 results taken from ECDC PPS 2023.*

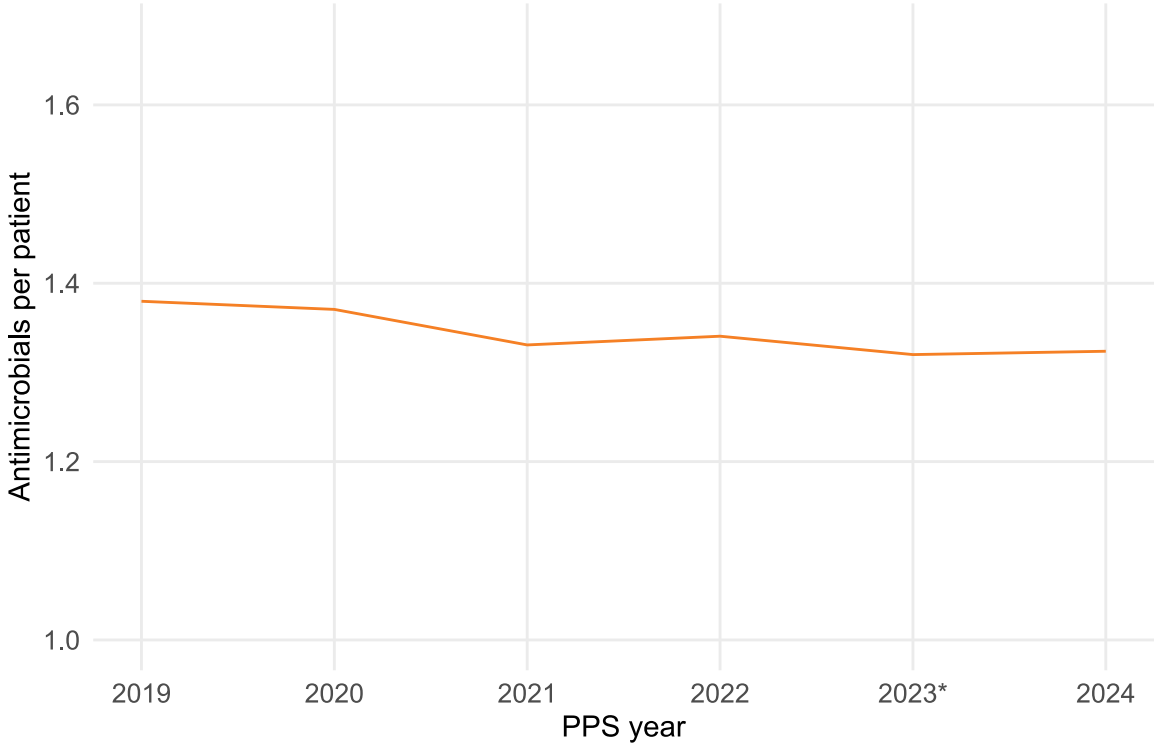

*Figure 2.3: Antimicrobials per patient, over time. *2023 results taken from ECDC PPS 2023.*

2.2. Prevalence of antimicrobial prescribing

- The overall national prevalence of hospital antimicrobial use in 2024 was 40.9% (Figure 2.4).
- The prevalence of antimicrobial use varies by speciality (Figure 2.4). ICU showed the highest prevalence of antimicrobial use at 57.6%, followed by surgical with a prevalence of 55.6%, then medical with a prevalence of 37.3%.

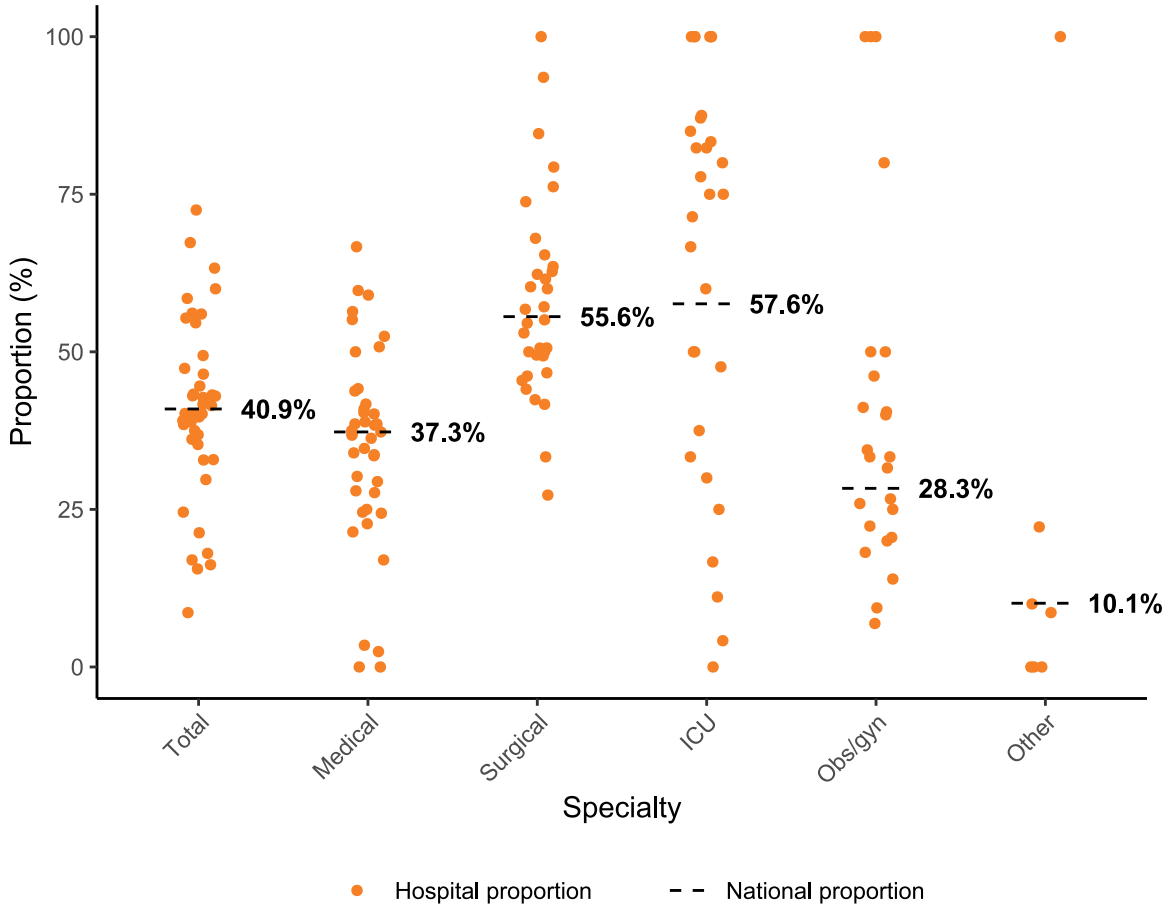

Figure 2.4: Patients receiving antimicrobials, by specialty

- The prevalence of antimicrobial use in hospitals varies between a low of 8.6% of patients on antimicrobials to a high of 72.5% of patients.
- As shown in Figure 2.5, the distribution of prevalence varies within hospital models, with Model 4 hospitals showing comparatively similar prevalences (standard deviation: 2.1%; coefficient of variation: 0.05) and high variability of antimicrobial prevalences among specialist hospitals (standard deviation: 20.3%; coefficient of variation: 0.64).
- Private hospitals show the highest overall prevalence at 51.3%, followed by Model 4 and Model 3 public hospitals with an overall prevalence of 42.2% and 42.1%, respectively. Model 2 hospitals had an overall prevalence of 31.5% and Specialist hospitals show the lowest overall prevalence at 26.1%.

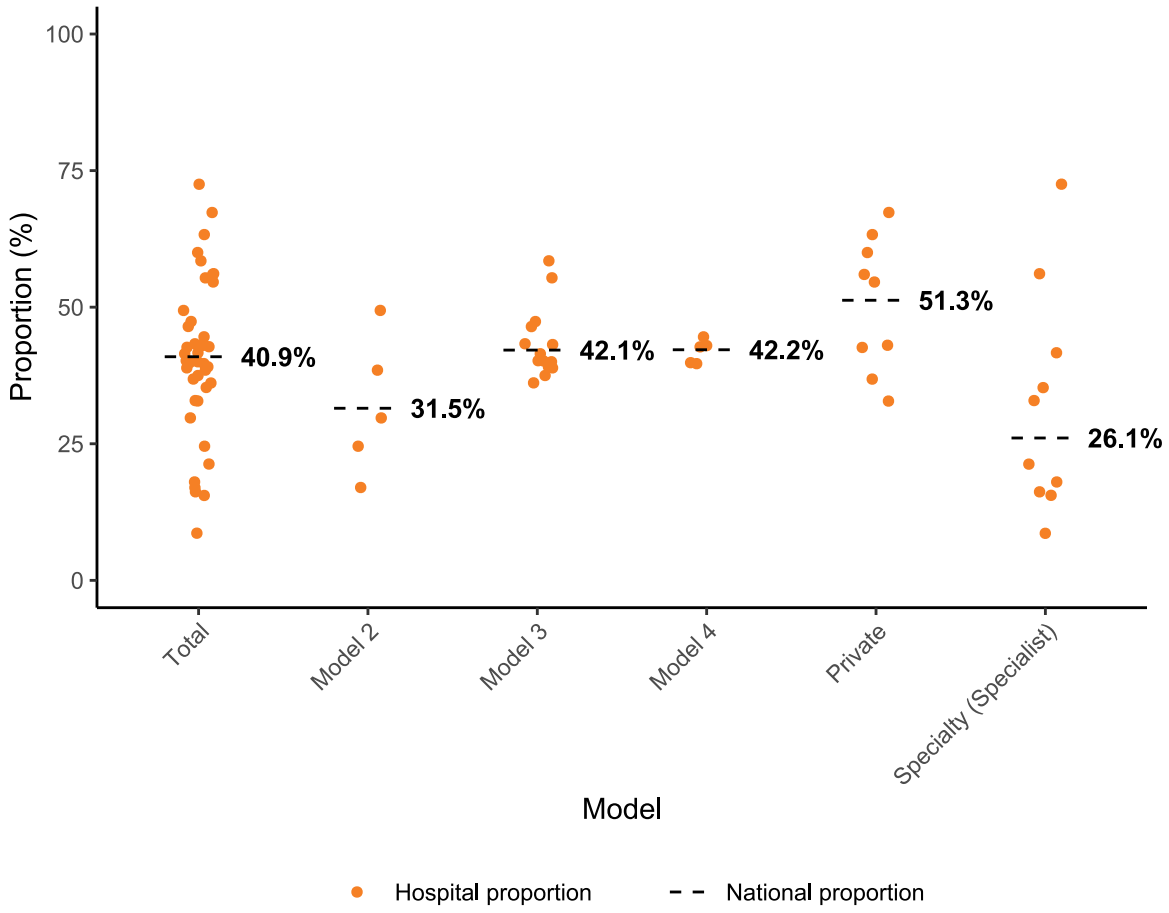

Figure 2.5: Prevalence of patients receiving antimicrobials, by hospital model.

- A full list of participating hospitals in Table A1.2 and a breakdown of key metrics by hospital model is outlined in Table A1.1.

2.3. Antimicrobial agents prescribed

- The full list of antimicrobial agents prescribed in the 2024 acute hospital, along with current and historical prescription statistics can be found in Table A2.4.

- This report includes an analysis of the antimicrobial agents prescribed in the 2024 acute hospital PPS using two categorisation systems: the WHO AWaRe categorisation and the National AMRIC Green, Amber, Red categorisation.

The **World Health Organization (WHO)** classifies antibiotics into three categories, **Access, Watch, and Reserve,** collectively known as the **AWaRe classification**.[2]

- Access antibiotics have a narrow spectrum of activity, meaning they target fewer types of bacteria. They generally cause fewer side effects, have a lower risk of contributing to antimicrobial resistance (AMR), and are more cost-effective.
- Watch antibiotics have a higher potential to promote AMR. They are typically used in hospitals for treating more severe infections and should be carefully monitored to prevent overuse.
- Reserve antibiotics are last-resort antibiotics, used only for treating severe and/or antibiotic resistant infections under the guidance of an infection specialist. Their use must be tightly controlled to maintain their effectiveness.

Many international organisations set targets with reference to the WHO AWaRe categorisation:

- The WHO sets a target of at least 60% of total antibiotic consumption (both hospital and community consumption) being Access group antibiotics.[3]
- The EU Council sets a target that by 2030 at least 65% of the total consumption of antibiotics in humans is from the Access group of antibiotics.[4]
- The UN General Assembly High level meeting on AMR set a target that at least 70% of antibiotics used for human health globally should belong to the Access group.[5]

- The 2024 acute hospital PPS found the proportion of antimicrobials used based on WHO AWaRe Access classification was 47.2% (Figure 2.6), a slight decrease from 48.3% in 2022.

- The proportion of Reserve antimicrobials was 3.1%, a slight decrease from 3.3% in 2022.

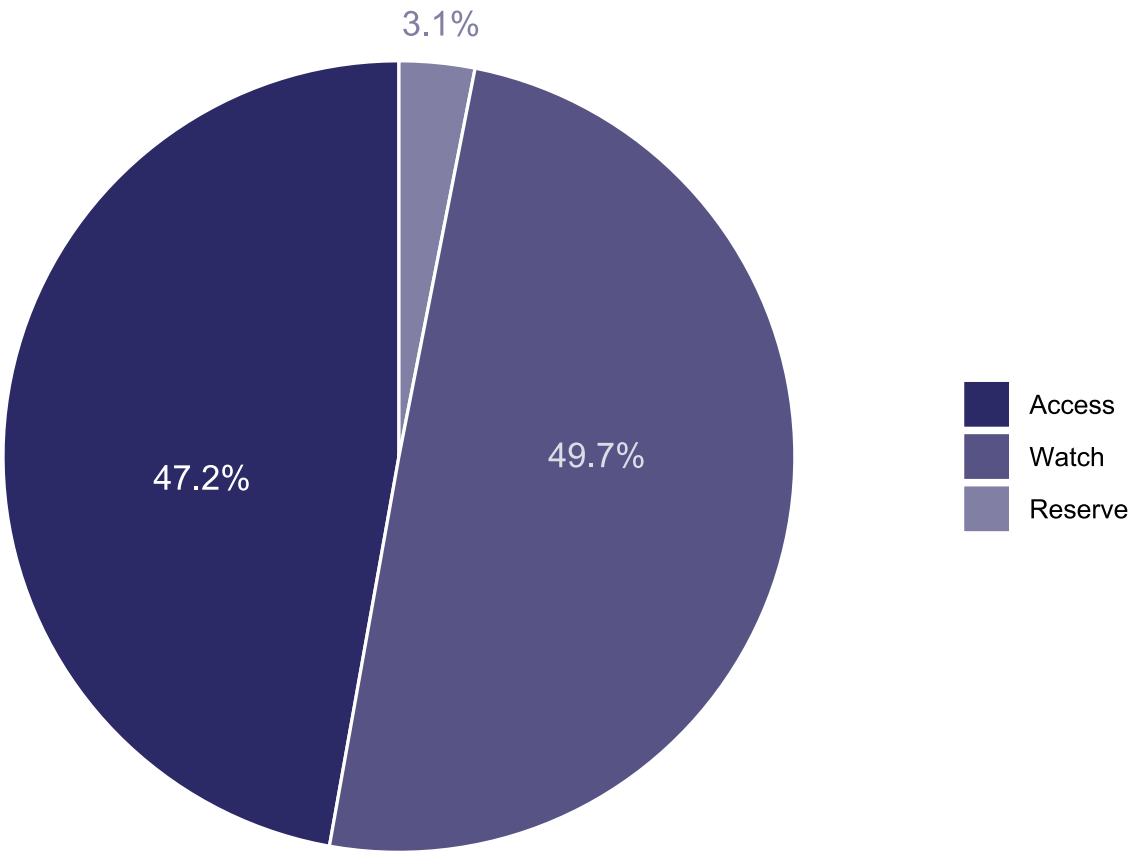

Figure 2.6: Proportion of antimicrobials used based on WHO AWaRe classifications.

The **National AMRIC Green, Amber, and Red antimicrobial categorisation** was developed by HSE AMRIC and is adapted from the WHO AWaRe framework.[6] It incorporates:

- consistency with the established Green/Red categorisation used in community settings
- alignment with antimicrobials approved for use in the HSE
- inclusion of antivirals and antifungals, many of which are already classified as reserve agents in hospitals
- consideration of other national AMS initiatives

This new classification aligns with the HSE Reserve Antimicrobial Policy, published in December 2024. It is designed to enable more effective local and national data analysis, as well as support quality improvement initiatives.

- The proportion of antimicrobials used based on national AMRIC Green classification was 24.3% (Figure 2.7).
- The proportion of antimicrobials used based on national AMRIC Red classification was 7.6%. Model 4 hospitals had the highest relative proportion of Red antimicrobial use (12.2%) (Table A1.1).

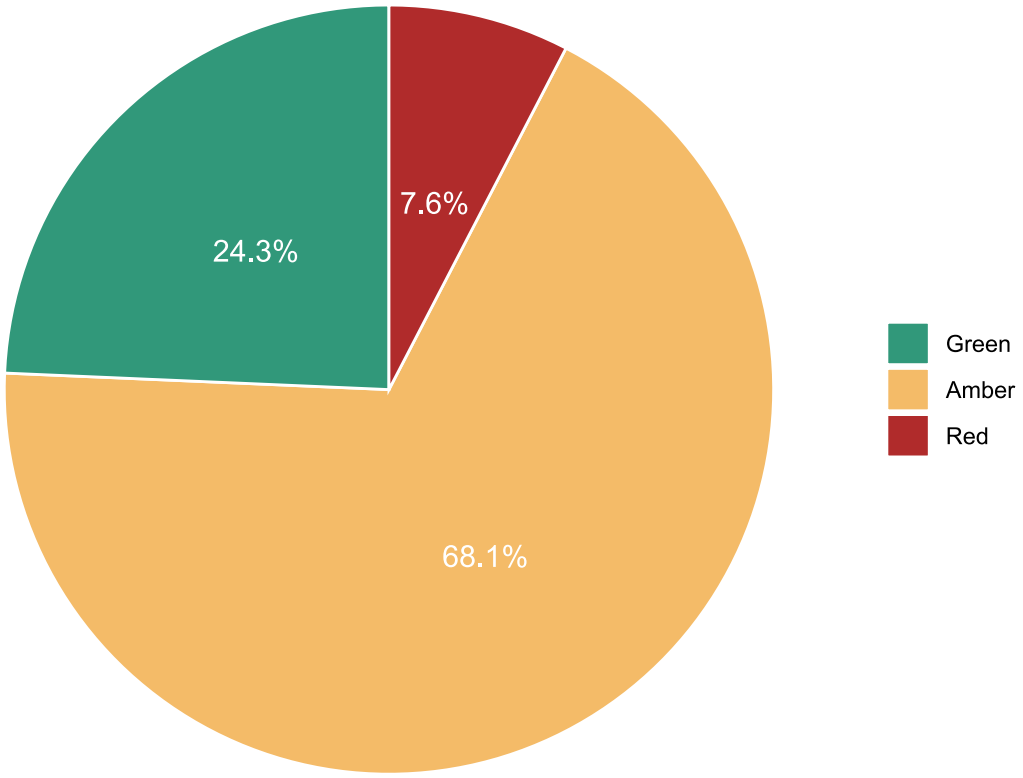

Figure 2.7: Number of antimicrobials used based on AMRIC Green/Amber/Red classifications.

- The top five mostly commonly prescribed Red antimicrobials were meropenem (3.1%), linezolid (0.8%), daptomycin (0.6%), posaconazole (0.6%) and amphotericin B (0.5%).
- Overall, the top five most prescribed agents were: amoxicillin/clavulanic acid 18.7% (n=923), piperacillin/tazobactam 17.8% (n=880), cefuroxime 7.1% (n=352), metronidazole 5.7% (n=279) and flucloxacillin 4.2% (n=206).
- Figure 2.8 illustrates trends in the usage of the top 10 antimicrobials since 2019. An apparent trend towards increased piperacillin/tazobactam usage and reduced amoxicillin/clavulanic acid usages since 2019 is observed. An increasing trend in cefuroxime usage is also noted. Usage of meropenem, the only 'Red' agent in the top 10 antimicrobials, appears to be relatively stable.
- Of the 68.1% Amber antimicrobials prescribed in the 2024 acute hospital PPS, two broad-spectrum antimicrobials amoxicillin/clavulanic acid and piperacillin/tazobactam account for the majority of this prescribing with a combined proportion of 36.5% of all antimicrobials prescribed in the 2024. This overall combined usage remains relatively similar over the last number of years (2023: 36.9%, 2022: 36.3%).

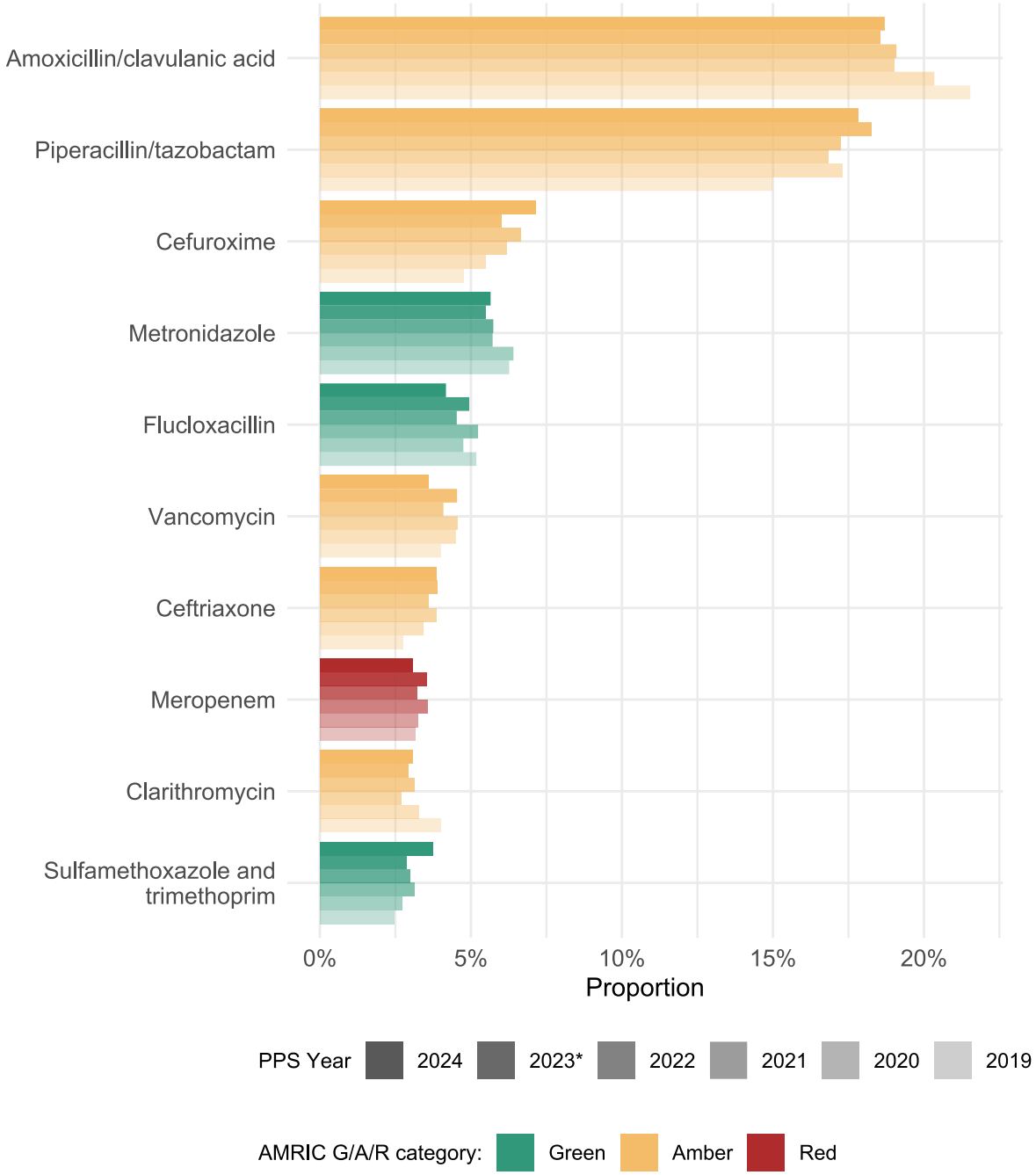

*Figure 2.8: Top 10 antimicrobials by usage. *2023 results taken from ECDC PPS 2023.*

2.4. Indication and diagnostic site for antimicrobial use

- Most indications for antimicrobial use were community-acquired infections (53.1%), followed by 22.3% healthcare-associated infection, 10.8% surgical antibiotic prophylaxis, and 8.7% medical prophylaxis. The trend over the last number of years is shown in Table A2.7.
- As in previous years, pneumonia, intra-abdominal and skin & soft tissue infections were the most common body sites with infection for which antimicrobials were prescribed, with overall relative proportions of 24.8%, 15.7% and 10.9%, respectively (2023: 28.4%, 11.0% and 10.8%; 2022: 26.1%, 14.9% and 11.8%; 2021: 25.9%, 13.9% and 12.0%). See Figure 2.9 and Table A2.8 for further details.

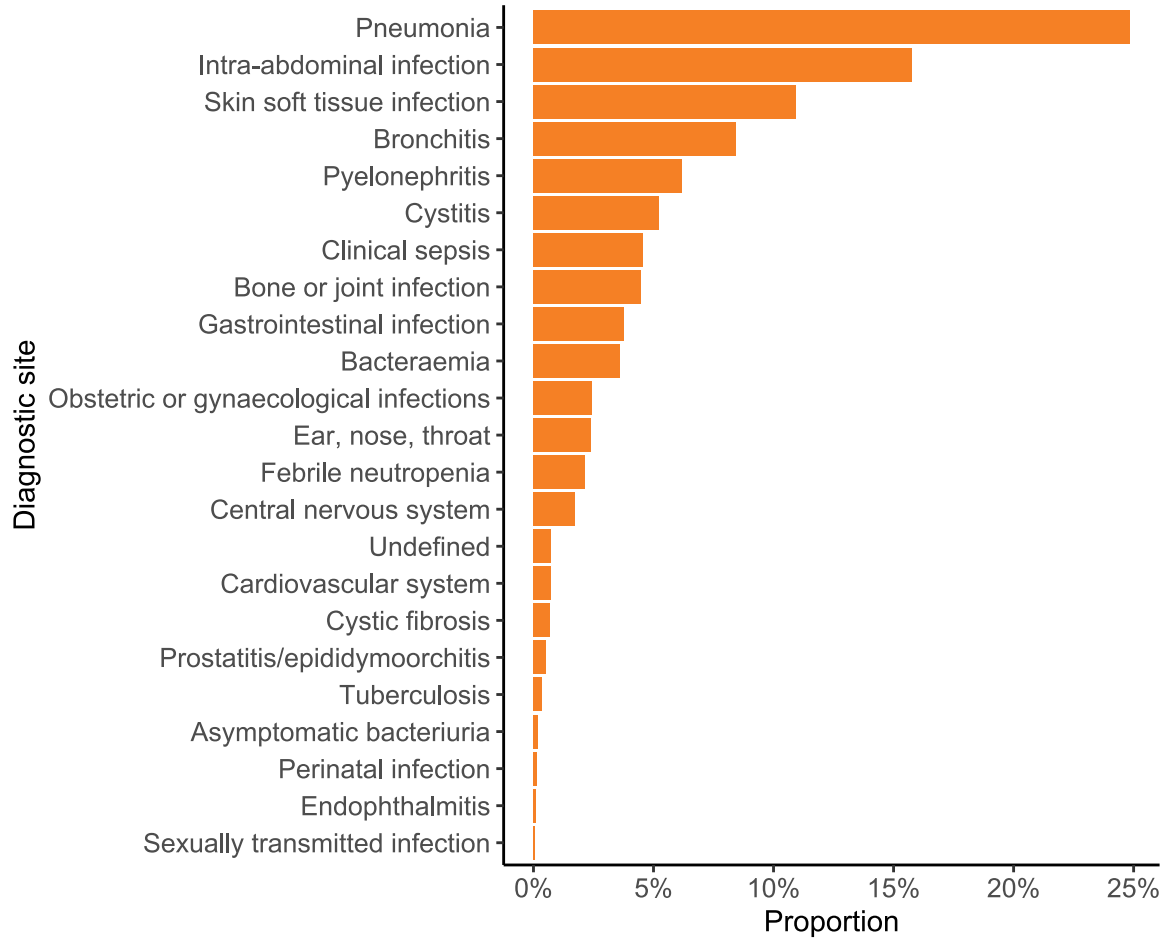

Figure 2.9: Diagnostic sites for antimicrobial therapy by relative proportions.

2.5. Appropriateness of antimicrobials

- Eighty-seven per cent of antimicrobial prescriptions were considered to be of appropriate duration at the time of the 2024 acute hospital PPS (Table A2.10) (2022: 85.9%, 2021: 84.3%, 2020: 88.8%).
  - Of the 536 antimicrobial prescriptions where the duration was considered not appropriate, the most commonly prescribed agents were amoxicillin/clavulanic acid (n=177), piperacillin/tazobactam (n=73), cefuroxime (n=60), metronidazole (n=37) and clarithromycin (n=24). (Table A2.12).

- It was also noted that 22.4% of nitrofurantoin prescriptions and 28.9% of trimethoprim prescriptions were of inappropriate duration.
- The majority of therapies classified as not appropriate duration were prescribed for community-acquired infections (256/536) and surgical prophylaxis (129/536). 9.8% of all antimicrobial prescriptions for community-acquired infections were considered to be of inappropriate duration. 24.2% of all antimicrobial prescriptions for surgical antibiotic prophylaxis were considered to be of inappropriate duration. See Table A2.13 for further details.
- The most common diagnostic site where duration was considered not appropriate were pneumonia (93/369), cystitis (48/369), bronchitis (46/369), intra-abdominal infection (46/369), and skin soft tissue infection (42/369). 10.7% of all antimicrobial prescriptions for respiratory tract infections (pneumonia and bronchitis) were considered to be of inappropriate duration.

- The percentage of antimicrobials where choice was in line with local guideline or microbiologist/infectious diseases physician advice was 84.5%, broadly similar to previous years (2022: 84.6%, 2021: 84.0%, 2020: 85.0%)
  - Of the 714 prescriptions where choice of agents was not in line with local guidelines or microbiologist/infectious diseases physician advice, the most commonly reported agents were for amoxicillin/clavulanic acid (n=227, overall proportion of 24.6% amoxicillin/clavulanic acid of prescriptions), piperacillin/tazobactam (n=148, overall proportion of 16.8% of piperacillin/tazobactam prescriptions) and metronidazole (n=54, overall proportion of 19.4% of metronidazole prescriptions). See Table A2.15.
  - In 19.9% and 21.7% of clarithromycin and ciprofloxacin prescriptions respectively, the choice of agent was not in line with local guidelines or advised by microbiologist/infectious diseases physician.
  - The majority of antimicrobial prescriptions where choice of agent was not in line with local guidelines or microbiologist/infectious diseases physician advice were for community- acquired infections (n=442/714, overall proportion of 16.9% of community-acquired infections). See Table A2.16.
  - The most common diagnostic site where antimicrobial agent was not in line with local guidelines or microbiologist/infectious diseases physician advice were pneumonia (164/581, overall proportion of 17.0% of pneumonia prescriptions), bronchitis (99/581, overall proportion of 30.1% of bronchitis prescriptions) and intraabdominal infections (77/581, overall proportion of 12.6% of intra-abdominal infections). 20.3% of all antimicrobial prescriptions for respiratory tract infections (pneumonia and bronchitis) were not in line with local guidelines or microbiologist/infectious diseases physician advice. See Table A2.17.
  - Speciality hospitals had the highest compliance of agent choice with local guidelines or microbiologist/infectious diseases physician advice at 92.3%, followed by Model 2 hospitals (89.9%) and Model 4 hospitals (87.3%).

- The majority (74.1%) of antimicrobials remained unchanged for the infection episode at the time of the 2024 acute hospital PPS. This represents an increase from 72.2% in ECDC PPS 2023 and 67.5% in 2017.

- 14.1% of antimicrobial prescriptions had been escalated to a more broad-spectrum antimicrobial (2023: 14.9%), while 5.6% had been de-escalated to a more narrow-spectrum antimicrobial (2023: 5.7%).
- A further 4.8% had been switched from parenteral to oral treatment (2023: 4.1%).

2.6. Surgical antibiotic prophylaxis

- Surgical antibiotic prophylaxis accounted for 10.8% (n=534) of antimicrobial use in the 2024 acute hospital PPS. This proportion has remained stable over the last number of years (2023: 11.2% (n=678), 2022: 10.8% (n=561)).
- In 2024, 26.0% of therapies prescribed for surgical antibiotic prophylaxis were extended beyond 24 hours (Table A1.1). This represents a decrease from the previous two years (2023: 29.5%, 2022: 33%) (Figure 2.10).

HSE AMRIC action plan 2022-2025 surgical antibiotic prophylaxis target:[7]

- 2024 target: 22% of surgical antibiotic prophylaxis extended beyond 24 hours
- 2025 target: 20% of surgical antibiotic prophylaxis extended beyond 24 hours

- Model 4 hospitals showed the highest proportion of surgical antibiotic prophylaxis extended beyond 24 hours at 39.6%, with specialty hospitals showing the lowest prevalence at 16.3% (Table A2.18).
- In contrast, speciality hospitals showed the highest prevalence for single dose surgical prophylaxis at 46.2%, with model 2 hospitals demonstrating the lowest prevalence at 25.6%.

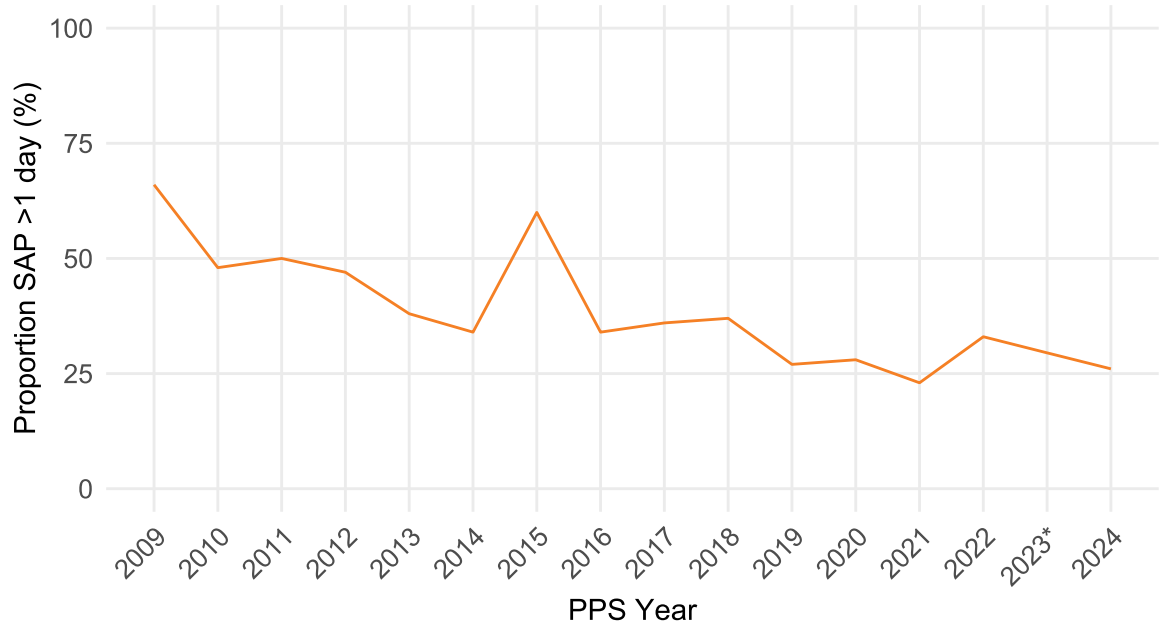

*Figure 2.10: Historical trend in proportion of surgical prophylaxis extended beyond 1 day. *2023, 2017 and 2012 results taken from ECDC PPS of Hospital-Acquired Infections & Antimicrobial Use in European Acute Care Hospitals.*

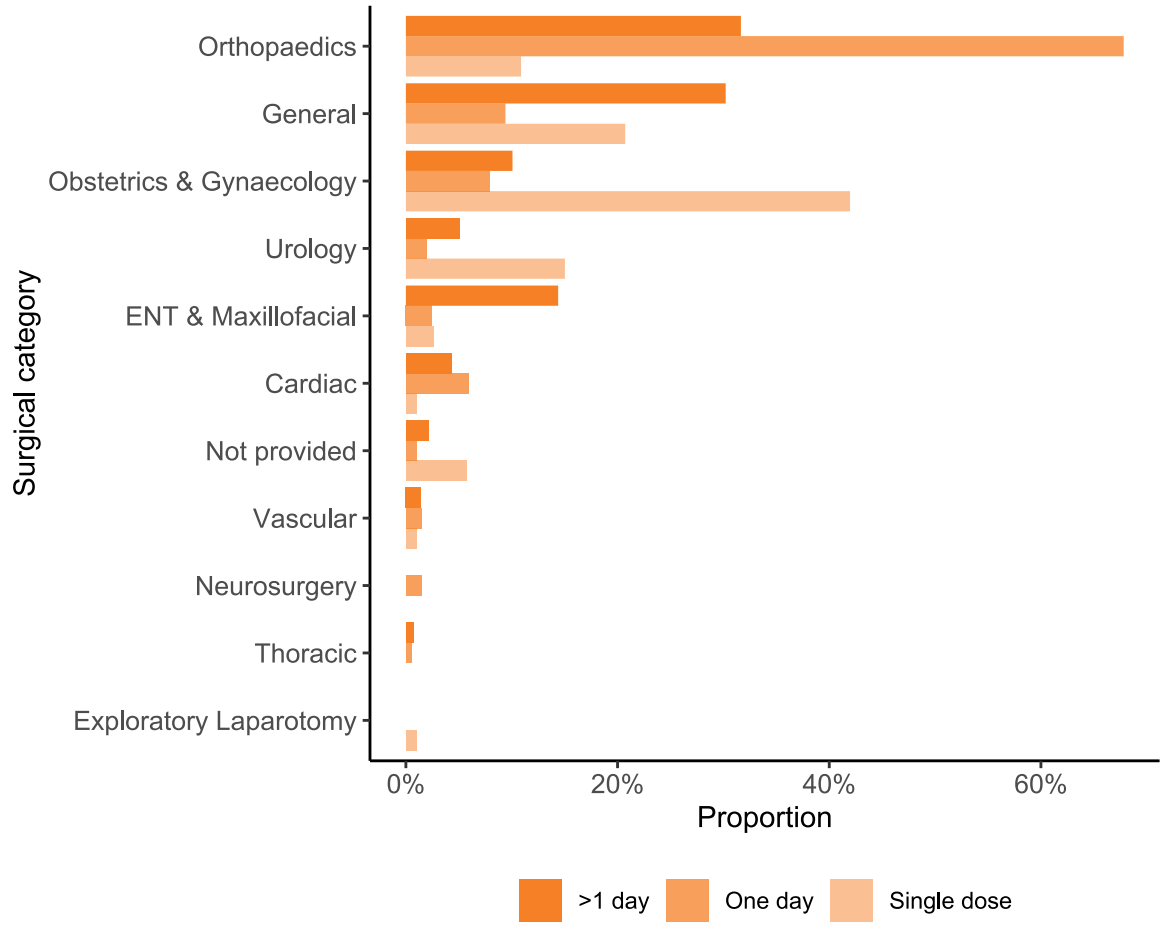

Figure 2.11: Relative proportions of surgical categories with surgical antimicrobial prophylaxis. The proportion for each surgical category represents their relative proportion within each surgical antimicrobial prophylaxis duration category. Note: As per 2024 acute hospital PPS protocol, data is not captured for all surgeries within a specific surgical category where antibiotics are not prescribed.

- The orthopaedics and general surgery categories showed the highest relative proportion of surgical antibiotic prophylaxis extended beyond 24 hours at 31.7% (n= 44/139) and 30.2% (n=42/139) respectively. This was followed by ENT & maxillofacial (14.4%), obstetrics and gynaecology (10.1%) and urology (5.0%). Proportions for all surgical categories can be found in Table A2.20.
- A reason was documented for extending surgical antibiotic prophylaxis beyond 24 hours in 34.5% (48/139) of cases. This is a slight increase from 30.9% (55/178) in 2022. (Figure 2.12 and Table A2.19).
- Where a reason for continuing an antibiotic beyond 24 hours was given, 8.6% (n=12/139) were observed to be in line with locally approved guidelines (appropriate), compared to 10.1% (n=18/178) in 2022. The reason reported as “drain in place” (inappropriate) was given in a further 8.6% (n=12/139) of prescriptions, compared to 5.6% (n=10/178) in 2022. “Other” reasons were cited in 17.3% (n=24/139), compared to 15.2% (n=27/178) in 2022. (Figure 2.12 and Table A2.19).
- As per national position statement, surgical antibiotic prophylaxis duration may be extended to 48 hours for certain categories of surgical procedures: maxillofacial surgery, cardiac surgery, and head and neck surgery. The 2024 acute hospital PPS found where

surgical antibiotic prophylaxis was extended beyond 24 hours the surgical procedure codes encompassing the following surgical categories: ENT & Maxillofacial - Neck surgery, and cardiac – all surgical procedures, accounted for 18.7% (26/139) of surgical procedures. Of the 8.6% (12/139) of cases where the reason given for extending surgical antibiotic prophylaxis beyond 24 hours was in line with locally approved guidelines, none were for ENT & Maxillofacial or cardiac surgical categories.

- Further detailed analysis of surgical antibiotic prophylaxis can be found in Appendix A2.5.

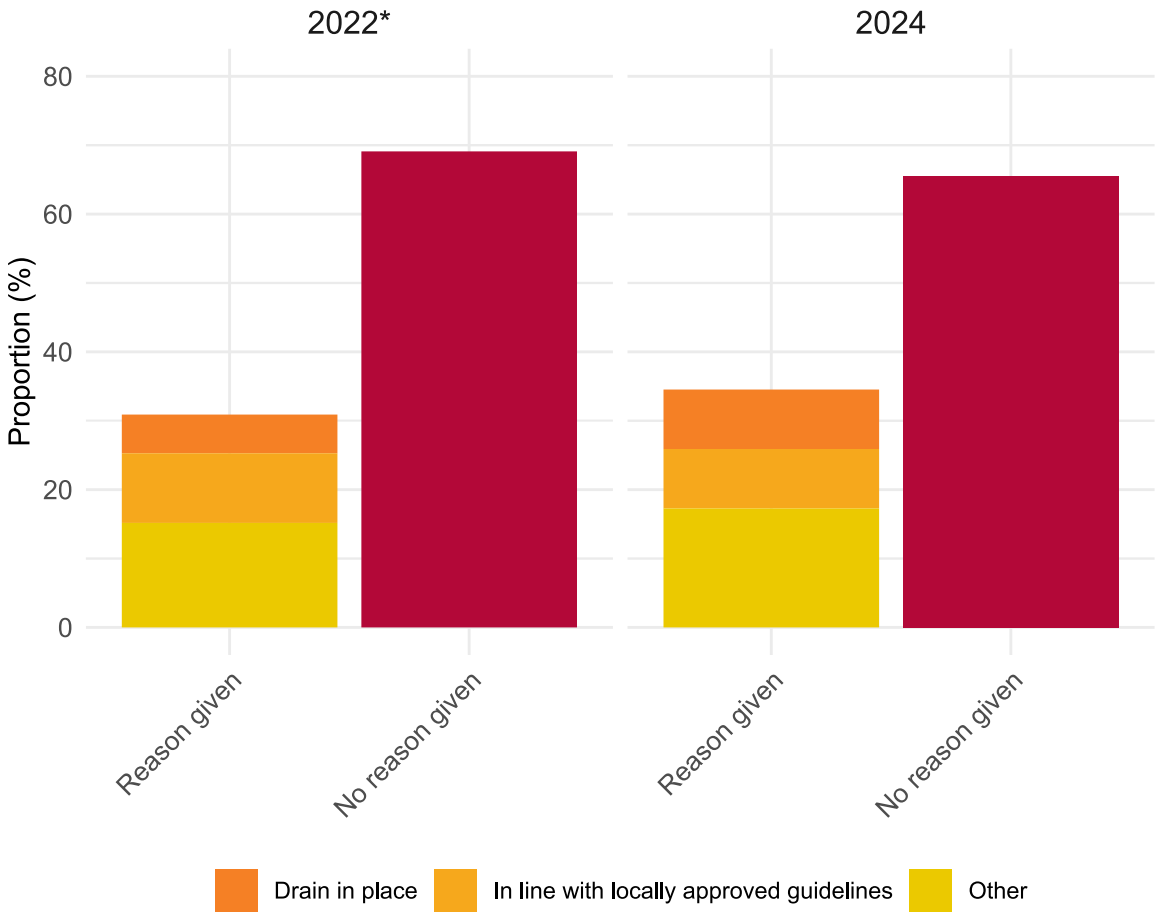

*Figure 2.12: Reasons for extending surgical prophylaxis. *Additional categories existed in the 2022 PPS. These were collapsed into the "Other" category in this figure.*

2.7. Parenteral and oral route

- The majority of antimicrobials were administered via the IV route (68.0%; Table A2.23).
- The proportion of all IV therapies suitable for oral switch as per local guidelines was 16.6% (2022: 14.2%). See Table A2.24.
- Figure 2.13 describes patients on IV antimicrobials suitable for oral switch. Of the 512 patients on IV antimicrobials who were considered suitable for oral switch, 504 were on other oral medications (98.4%).

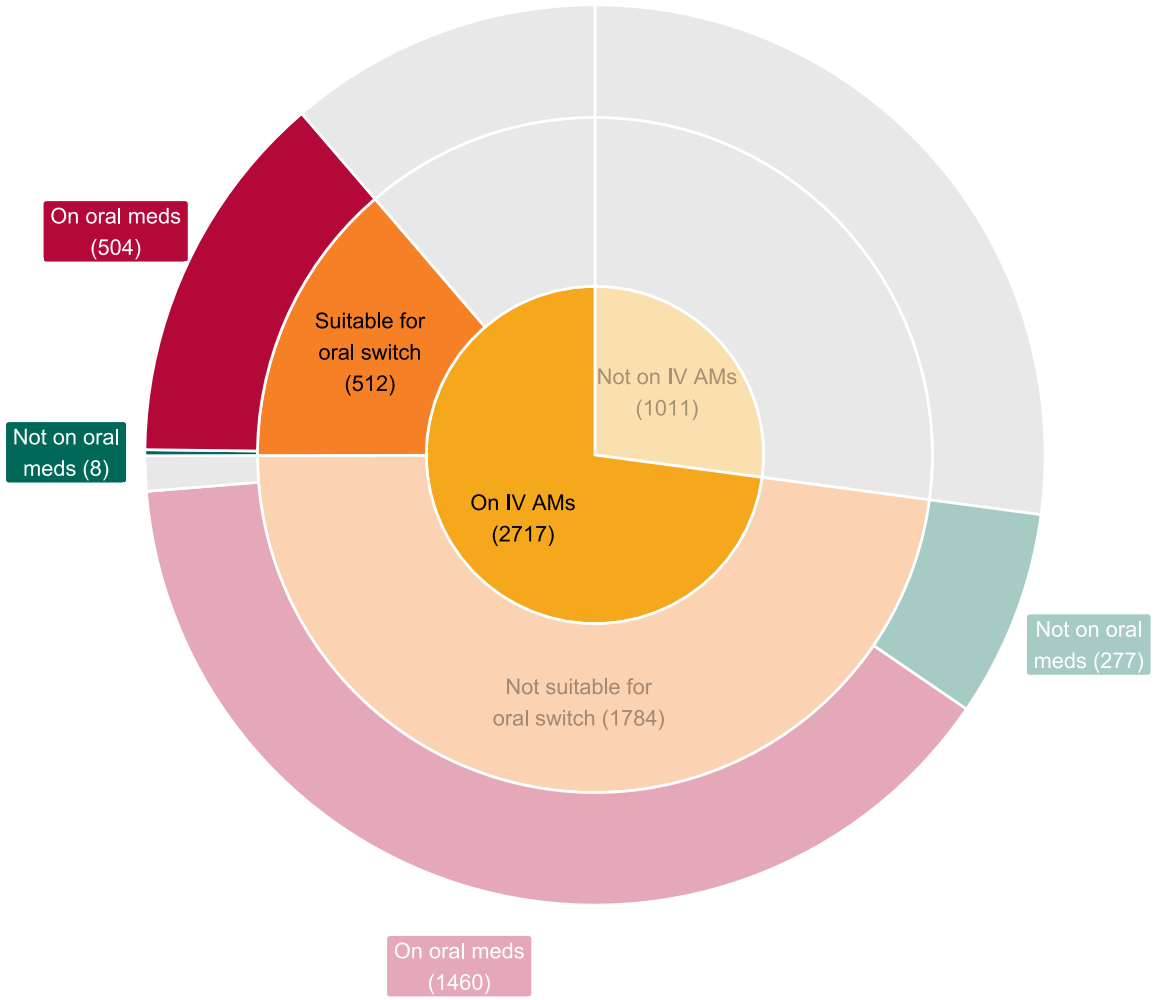

Figure 2.13: Patients on IV antimicrobials, who are deemed suitable for oral switch and are currently taking oral medications. The coloured slices represent patients of interest, while the grey slices represent patients with non-applicable or unknown status. Innermost ring: Patients on IV antimicrobials vs. not on IV antimicrobials. Middle ring: Whether the patients are suitable for an oral switch. Outer ring: Whether the patients are on oral medications. Labels show the number of patients in each (sub)category.

- The top 10 antimicrobials prescribed via the IV route are shown in Table 2.1.
- Table 2.2 shows the proportion of prescriptions for agents classified as agents of excellent oral bioavailability (i.e. >90%), that were administered by the parenteral route.
- The only agent of excellent oral bioavailability in the top 10 IV antimicrobials used was metronidazole, while amoxicillin/clavulanic acid and flucloxacillin were the only listed agents with direct oral alternatives available. The remaining agents in the list of the top 10 IV antimicrobial agents used do not have direct oral alternatives (piperacillin/tazobactam, ceftriaxone, vancomycin, meropenem, gentamicin, cefotaxime) or the oral option has poor oral bioavailability (cefuroxime).

Table 2.1: Top 10 IV antimicrobials by usage ranked by total usage (n) and proportion of all IV antimicrobials (%).

Antimicrobial	WHO AWaRe category	AMRIC G/A/R category	Drug class	Total (n)	*Proportion (%)*
Piperacillin/tazobactam	Watch	Amber	Antibiotic	880	*26.2*
Amoxicillin/clavulanic acid	Access	Amber	Antibiotic	610	*18.2*
Cefuroxime	Watch	Amber	Antibiotic	348	*10.4*
Ceftriaxone	Watch	Amber	Antibiotic	190	*5.7*
Metronidazole	Access	Green	Antibiotic	172	*5.1*
Flucloxacillin	Access	Green	Antibiotic	154	*4.6*
Vancomycin	Watch	Amber	Antibiotic	153	*4.6*
Meropenem	Watch	Red	Antibiotic	152	*4.5*
Gentamicin	Access	Amber	Antibiotic	120	*3.6*
Cefotaxime	Watch	Amber	Antibiotic	64	*1.9*

Table 2.2: Antimicrobials with excellent oral bioavailability prescribed by the IV route

Antimicrobial	2019		2020		2021		2022		2024	
	(n)	*(%)*	(n)	*(%)*	(n)	*(%)*	(n)	*(%)*	(n)	*(%)*
Clindamycin	45/67	*67.2*	27/43	*62.8*	33/50	*66.0*	43/65	*66.2*	54/74	*73.0*
Metronidazole	207/294	*70.4*	193/286	*67.5*	186/297	*62.6*	211/299	*70.6*	172/279	*61.6*
Linezolid	16/33	*48.5*	14/32	*43.8*	21/44	*47.7*	20/40	*50.0*	22/41	*53.7*
Levofloxacin	15/40	*37.5*	5/24	*20.8*	7/36	*19.4*	12/34	*35.3*	11/32	*34.4*
Ciprofloxacin	53/132	*40.2*	32/113	*28.3*	45/115	*39.1*	39/104	*37.5*	30/92	*32.6*
Rifampicin	2/17	*11.8*	0/18	*0.0*	1/10	*10.0*	0/11	*0.0*	0/8	*0.0*
Moxifloxacin	0/2	*0.0*	0/3	*0.0*	0/1	*0.0*	0/1	*0.0*	0/0	-

2.8. In-depth analyses – selected antimicrobials

Refer to Appendix A2.7 for further detail on in depth analysis of selected antimicrobials.

Piperacillin/tazobactam

- The proportion of piperacillin/tazobactam prescribed for community-acquired infection was 53.9%, while 38.1% was prescribed for hospital-acquired infections. The most common diagnostic sites for piperacillin/tazobactam prescription were respiratory tract infections (pneumonia and bronchitis, 45.0% combined), intra-abdominal infection (19.0%), pyelonephritis (7.5%) and clinical sepsis (7.1%).
- In 82.5% of cases the agent choice of piperacillin/tazobactam was in line with local guidelines or microbiologist/infectious diseases physician advice, which was slightly lower than overall compliance for this parameter for all antimicrobials (84.5%).
- Of the 16.8% (n=148) of prescriptions for piperacillin/tazobactam where the choice of agent was not in line with local guidelines or microbiologist/infectious diseases physician advice, 73.6% were for community-acquired infection while 14.2% were for healthcare-associated infections. The most common diagnostic sites where choice of agent was reported to be non-compliant were respiratory tract infections (bronchitis and pneumonia, 61.1% combined) and intra-abdominal infections (17.3%).
- 8.3% of piperacillin/tazobactam prescribed was of inappropriate duration (n=73).
- 71.1% of piperacillin/tazobactam prescriptions remained unchanged at the time of the 2024 acute hospital PPS, which is lower than the overall proportion of all antimicrobials that remained unchanged at the time of the PPS (74.1%). Of the 28.9% that were changed, 25.8% had been escalated to piperacillin/tazobactam.

Meropenem

- Meropenem accounts for the majority of carbapenem usage in the 2024 acute hospital PPS, accounting for 3.1% (n=152) of overall antimicrobial use, followed by ertapenem 0.1% (n=5).
- The proportion of meropenem prescribed for community-acquired infection was 55.9%, while 40.8% was prescribed for hospital-acquired infections.
- The most common diagnostic site for meropenem prescription was pneumonia (23.2%), followed by intra-abdominal infection (18.5%), pyelonephritis (14.5%), bacteraemia (9.9%), and clinical sepsis (6.0%).
- In 90.7% of cases the agent choice of meropenem was in line with local guidelines or microbiologist/infectious diseases physician advice, which was higher than overall compliance for this parameter for all antimicrobials (84.5%).
- Of the 9.2% (n=14) of prescriptions for meropenem where the choice of agent was found not to be in line with local guidelines or microbiologist/infectious diseases physician advice, 50.0% were for community-acquired infection while 42.9% were for healthcare-associated infections. The most common diagnostic sites where choice of agent was reported to be non-compliant were pneumonia (46.2%) and skin and soft tissue infection (15.4%).
- 71.1% of meropenem prescriptions had been escalated to that agent.

Metronidazole

- Metronidazole was the fourth most commonly prescribed antimicrobial in the 2024 acute hospital PPS, accounting for 5.7% of all antimicrobial prescriptions (n=279).
- 61.6% of prescriptions were for IV use.
- The majority of metronidazole was prescribed for community-acquired infection (64.2%) followed by 25.4% for hospital-acquired infection. The most common diagnostic sites for metronidazole prescription were intra-abdominal infections (n=111, 42.9%), gastrointestinal infections (n=36, 13.9%) and pneumonia (n=30, 11.6%).
- The choice of agent was in line with local guidelines or microbiologist/infectious diseases physician advice for 79.5% of metronidazole prescriptions (Table A 2.27), which was lower than overall compliance of all antimicrobials for this parameter (84.5%).
- Of the 54 prescriptions for metronidazole where the choice of agent was not in line with local guidelines or advised by an infection specialist, 66.7% were for community- acquired infection while 18.5% were for healthcare-associated infections. The most common diagnostic sites where choice of agent was reported to be non-compliant were intra-abdominal infections (43.8%, 21/48), gastrointestinal infections (20.8%, 10/48) and skin and soft tissue infections (16.7%, 8/48) (Table A2.29). Of the 54 prescriptions for metronidazole where the choice of agent was not in line with local guidelines or advised by an infection specialist, 79.6% were for the IV route (Table A2.31).
- The proportion of IV metronidazole that was considered suitable for oral switch was 34.9% (60/172), which was notably higher than the overall proportion of all antimicrobials considered suitable for oral switch (16.6%).
- It was also noted that 75.0% of IV metronidazole was prescribed for patients on other oral medications (129/172).
- 27.6% of metronidazole prescriptions were in combination with a second antibiotic with anaerobic activity, the majority in combination with piperacillin/tazobactam (14.3%) and amoxicillin/clavulanic acid (10.0%) (Table A2.32).
- 13.3% of metronidazole prescribed was of inappropriate duration (n=37).

2.9. Hospital participation, AMS structures and governance

- 2024 acute hospital PPS participation was the lowest since 2019 (Figure 2.14 and Table A2.33). Of the 43 participating hospitals, 34 were HSE public hospitals (79%) and 9 were private hospitals (21%).

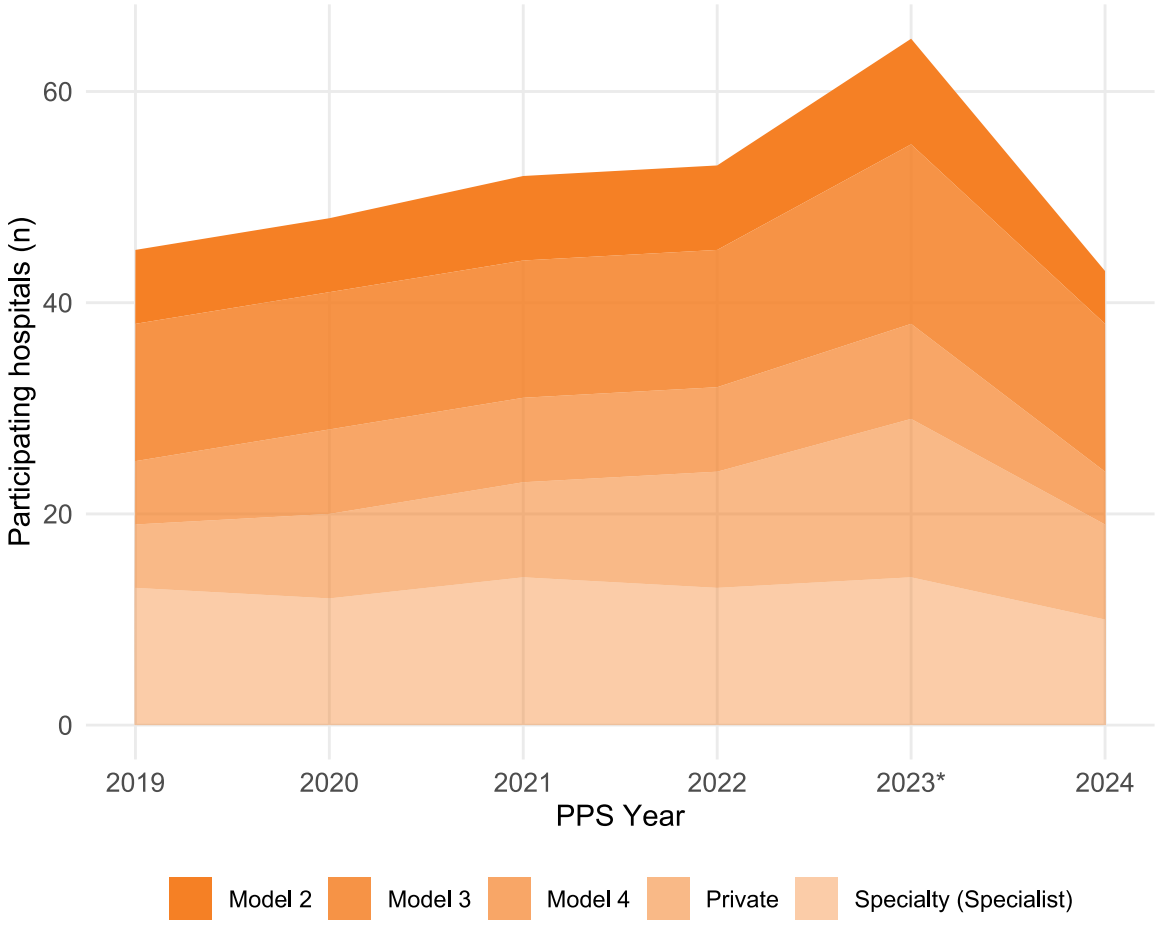

*Figure 2.14: Hospital participation over time. *2023 results taken from ECDC PPS 2023.*

- Participants of the 2024 National Antimicrobial PPS rated the median usefulness of the data collected to the hospital AMS programme at 8 out of 10 (Figure A2.1), where a score of 1 represented not at all useful and 10 represented highly useful.
- 100% (n=43) percent of participating hospitals had guidelines in place in their hospital, while 97.7% (n=42) had a guideline app available.
- 97.7% (n=42) of participating hospitals had an antimicrobial restriction policy in place, with 74.4% (n=32) updated in last 3 years. 34.9% (n=15) of participating hospitals carried out retrospective review of restricted agents, while 46.5% (n=20) used a pre-authorisation process
- 100% (n=43) of hospitals had local surgical antibiotic guidelines in place that aligned with the national surgical antibiotic prophylaxis duration position statement.

3. Discussion

3.1. Main discussion

Proportion of patients on antimicrobials in Irish acute hospitals remains high
In the 2024 acute hospital PPS the proportion of patients on antimicrobials was the highest proportion since 2019. The 2023 ESAC-net antimicrobial consumption report found that hospital sector consumption of antimicrobials in Ireland continues to be above the EU/EEA mean, remaining relatively consistent over the last number of years.[8] Furthermore, in the ECDC PPS 2023 Ireland had a lower predicted prevalence of antimicrobial use based on patient case-mix and hospital characteristics compared to the observed prevalence of antimicrobial use.[9] In light of the 2023 EU council recommendations for Ireland for a 27% reduction in overall antimicrobial use (community and acute) by 2030,[4] there is a need to strengthen efforts to address unnecessary and inappropriate prescribing of antimicrobials in the acute hospital setting.
The prevalence of antimicrobial use observed in the 2024 acute hospital PPS showed a wide variation by speciality across hospitals. This variation in prevalence of use was also seen by hospital type, apart from participating model 4 hospitals, which all reported very similar proportions of patients receiving antimicrobials. AMS collaboration and shared learning across both regions and speciality groups has the potential to support best practice and reduce variation in AMS across the system.

High compliance with antimicrobial guidelines and expert advice
Encouraging findings from the 2024 acute hospital PPS included the sustained high compliance with choice of antimicrobial in line with local guidelines or microbiologist/ infectious diseases physician advice and the continued high proportion of antimicrobial prescriptions of appropriate duration. There was also a downward trend in the number of antimicrobials per patient since 2019.

Increased review of antimicrobial prescriptions will support prudent antimicrobial use
In line with the *Start Smart then Focus* antibiotic care bundle, all antimicrobial prescriptions should be reviewed within 24-48 hours of commencement to make an antimicrobial prescribing decision which could include stopping antimicrobials, switching from IV to oral, escalating or de-escalating the agent as clinically appropriate.[10] Early antimicrobial review is essential to ensure safe effective patient care. The percentage of antimicrobials with a change during treatment is an important indicator as higher rates of change are correlated with a lower levels of resistance (as measured by a composite index of AMR, % resistant isolates).[9] Both de-escalation and a switch to oral treatment likely reflect the outcome of the review of antimicrobial treatment when microbiological sample results are available or when the patient's condition improves. These are recommended measures to support prudent antimicrobial use. The 2024 acute hospital PPS found there was a slight decrease in the proportion of antimicrobials that were changed during treatment (25.8%) compared to that reported in the 2023 ECDC PPS. However, Irish hospitals continue to perform well for this AMS indicator compared to many other EU/EEA countries, with percentage of antimicrobials changed since the initiation of treatment in the 2024 acute hospital PPS remaining above the EU/EEA rate of 18.3% reported in the 2023 ECDC PPS (ranging from 31.3% in Iceland to 6.2% in Bulgaria and 0% in Kosovo)".[9]

Respiratory tract infection and urinary tract infections are priority areas for AMS interventions

Several areas where antimicrobial review and quality improvement could be focussed were identified from the 2024 acute hospital PPS results.

1. Respiratory tract infections (bronchitis and pneumonia): for 20.3% of these prescriptions choice of agent was not in line with local guidelines or microbiologist/ infectious diseases physician advice and for 10.7% duration was considered to be inappropriately long.

2. Urinary tract infections: compared to other antimicrobials, a particularly high proportion of nitrofurantoin and trimethoprim prescriptions were of inappropriately long duration, representing another key area in need of focussed stewardship.

National AMRIC Green, Amber, and Red antimicrobial categorisation

- **Opportunity to increase AMRIC Green antimicrobial use**

Analysis of antimicrobial use utilising the new national AMRIC Green, Amber, and Red antimicrobial categorisation was completed for the first time in the 2024 acute hospital PPS. This new categorisation will allow targeted evaluation and monitoring of antimicrobial use in the Irish acute hospital setting and support appropriate antimicrobial use in line with national priorities. A key target for quality improvement is to increase the proportion of Green antimicrobials prescribed. 68.1% of antimicrobials prescribed in the 2024 acute hospital PPS were from the Amber category, with two broad-spectrum antimicrobials, amoxicillin/clavulanic acid and piperacillin/tazobactam, accounting for much of this prescribing. These two agents accounted for a combined proportion of 36.5% in 2024, which remained relatively stable over the last number of years. Due to the broad-spectrum profile of these agents, they have a propensity to promote AMR. There is opportunity to promote use of Green antimicrobials in preference to Amber and Red antimicrobials where appropriate as per AMRIC Reserve Antimicrobial Policy.

- **Opportunity to steward the use of piperacillin/tazobactam (AMRIC Amber antimicrobial) which is being used inappropriately for community acquired infections**

The increasing trend in the proportion of piperacillin/tazobactam over the last number of years is indicative of a trend towards broader spectrum antimicrobial use. It was noted that over half of prescriptions for piperacillin/tazobactam were for community-acquired infections, which would be considered inappropriate. When piperacillin/tazobactam was prescribed, it was less likely to be compliant with local guidelines or microbiologist/ infectious diseases physician advice compared to other antimicrobial prescribing. Approximately three-quarters of inappropriately prescribed piperacillin/tazobactam was for community-acquired infections. Respiratory tract infections (pneumonia and bronchitis) were the most common indication where piperacillin/tazobactam use was not in line with local guidelines or microbiologist/ infectious diseases physician advice, accounting for 61.1% of inappropriate choice of piperacillin/tazobactam. These represent key areas to focus antimicrobial stewardship efforts. A high proportion of piperacillin/tazobactam prescriptions (71.1%) remained unchanged at the time of the PPS. As a broad-spectrum agent, commonly used empirically, piperacillin/tazobactam represents a target for increased antimicrobial review and de-escalation to support prudent use of antimicrobials.

- **Opportunity to focus stewardship interventions on use of clarithromycin and ciprofloxacin (AMRIC Amber antimicrobials)**

Although clarithromycin use remains stable and the trend in ciprofloxacin use appears to be decreasing over the last number of years, the PPS highlighted that for approximately a fifth of prescriptions the choice of these agents were still not in line with guidelines or microbiologist/infectious diseases physician advice. These two Amber antimicrobials provide a further focus to direct stewardship efforts.

- **High compliance of meropenem use (AMRIC Red antimicrobial) with local guidelines or expert advice – need to sustain AMS efforts**

Reducing the proportion of Red (or reserve) agents (7.6% of all antimicrobials prescribed in the 2024 acute hospital PPS) is frequently cited in AMS guidance, position papers and other literature as an objective for quality improvement. Red antimicrobials are last-resort antimicrobials that should only be used on the advice of an infection specialist. Meropenem was the most commonly prescribed Red antimicrobial and a detailed sub-analysis of its use in the 2024 acute hospital PPS found that, encouragingly, over 90% of meropenem prescriptions were in line with local guidelines or microbiologist/ infectious diseases physician advice. Of the relatively small number of inappropriately prescribed meropenem prescriptions, over half were for community-acquired infections and most were for pneumonia and skin/ soft tissue infections. Model 4 hospitals had the highest relative proportion of Red antimicrobial use and there is a need for continued and sustained stewardship efforts in particular in these settings, especially in the context of increasing trends in multidrug resistant organisms. A target of >90% of prescriptions for Red antimicrobials with infection specialist authorisation (either pre-or post-) is set out in the HSE AMRIC reserve antimicrobial policy.[6] Continued evaluation of the Red classification in the national acute hospital PPS will allow for more meaningful analysis of trends and comparisons over time to inform AMS efforts both locally and nationally.

The proportion of antimicrobials administered intravenously remains relatively constant - there is opportunity to switch more antimicrobials from IV to oral

In line with previous PPS results, most antimicrobial use was administered by the parenteral route. The proportion of parenteral use saw a slight decrease in 2024, although this proportion remains relatively stable over the last number of years. In the 2024 acute hospital PPS 4.8% of prescriptions had undergone switch from IV to oral agent, which is a slight increase on the figure (4.1%) reported in the ECDC 2023 PPS. An increased proportion of IV therapies was found to be suitable for oral switch as per local guidelines compared to 2022. On the day of the PPS, 512 patients who were on IV antimicrobials were considered suitable for oral switch. The overwhelming majority of these patients were already on other oral medications (98.4%, 504/512) and therefore are very likely to be suitable candidates for oral antibiotics. Considering this estimated daily burden of inappropriate IV use, there is considerable potential benefit to be gained for patients, the healthcare system and the environment if these patients were receiving appropriate oral therapy.

All healthcare professionals should receive education on the agents of excellent oral bioavailability and be supported to use oral where appropriate and promote early IV to oral switch whenever possible. All healthcare professionals should be aware of and empowered to promote conversion of IV amoxicillin/clavulanic acid and flucloxacillin to the oral route where clinically appropriate and in line with local guidelines. However, analysis of the top 10 IV antimicrobials used reveals that seven of these agents (piperacillin/tazobactam, cefuroxime, ceftriaxone, vancomycin, gentamicin, meropenem, cefotaxime) may not have a clear oral alternative, and therefore require antimicrobial stewardship review and input in order to support IV to oral switch. This highlights the need for mechanisms to identify and prioritise

expert antimicrobial stewardship review of IV antimicrobial agents. There is significant scope to increase oral prescribing of some of the most common antimicrobials prescribed in IV form at the point of antimicrobial review, 24-48 hours after starting an IV antimicrobial. Overall, the findings of the 2024 acute hospital PPS highlight the need to promote oral prescribing and IV to oral conversion where clinically appropriate. As recommended in HSE AMRIC Antimicrobial Stewardship Guidance for all Healthcare Settings, oral prescribing should be used wherever possible.[11] A strengthened focus on IV to oral switch will be supported by publication of an AMRIC IV to oral switch toolkit in early 2025.[12]

There is an opportunity to stop unnecessary antibiotic use by reducing double anaerobic cover

Large proportions of certain antimicrobials with excellent oral bioavailability continue to be prescribed parenterally. Metronidazole represents an area for focussed improvement as it the fourth most prescribed antimicrobial, has 100% oral bioavailability and 61.6% of use is IV. Furthermore, compliance of choice of agent with local guidelines or microbiologist/infectious diseases physician advice was noted to be markedly lower for metronidazole and over a quarter of metronidazole was used in combination with a second agent with anaerobic activity. Double anaerobic cover is rarely indicated and represents an area to focus on to reduce inappropriate antimicrobial consumption. All healthcare professionals, including clinical pharmacists, nurses and NCHDs, should be educated and supported to carry out and prompt metronidazole antimicrobial review.

Overall, Ireland performs well on surgical antibiotic prophylaxis duration, but there remains opportunity for improvement, particularly in model 4 hospitals

There was an increase in the proportion of appropriate surgical antibiotic prophylaxis duration for 2024, compared to previous years. The 2023 ECDC PPS showed that Ireland had amongst the best rate of compliance with surgical antibiotic prophylaxis guidance (i.e. duration no longer than24 hours (7th lowest of 31 countries)) [9] and Irish acute hospitals continue to build on this and drive quality improvement in appropriate surgical antibiotic prophylaxis duration. Furthermore, all participating hospitals reported having local surgical antibiotic guidelines in place that aligned with the national surgical antibiotic prophylaxis position statement.[13] This is indicative of widespread knowledge and awareness of the national position statement among AMS teams in the acute hospital setting. Compliance with the national surgical antibiotic prophylaxis position statement (published Q3 2021) is a key measure outlined in the HSE AMRIC action plan 2022-2025.[7] Although showing great progress, the national proportion of surgical antibiotic prophylaxis greater than 1 day for 2024 (26%) is still above the national target for 2024 of 22%. Model 4 hospitals had the highest proportion of surgical antibiotic prophylaxis extended beyond 24 hours (39.6%). Variation in patient profile, sub-specialities and case mix likely contribute to variation in this metric across hospital models. There is a need to focus and support stewardship initiatives targeting surgical antibiotic prophylaxis in Model 4 hospitals as they carry the highest burden of antimicrobial prescribing for this indication.

In 2022, to identify areas for improvement related to surgical antibiotic prophylaxis, additional questions were added to the national acute hospital PPS. This included a question relating to documentation of a reason when surgical antibiotic prophylaxis was extended beyond 24 hours. The 2024 acute hospital PPS found that for the majority of cases of surgical antibiotic prophylaxis extended beyond 24 hours, there was no specific documented reason for this (65.5%), remaining similar to 2022 acute hospital PPS. Documentation is key to identifying targets for quality improvement.

The national position statement on surgical antibiotic prophylaxis duration recommends that antibiotic prophylaxis should not be continued on the basis that drains remain in place.[13] This

was cited as the reason for continuing antibiotic prophylaxis inappropriately beyond 24 hours in 8.6% of cases, a slight increase on that reported in 2022, which was 5.6%.

Almost one tenth of prescriptions where surgical antibiotic prophylaxis extended beyond 24 hours were observed to be prescribed appropriately in line with locally approved guidelines, which was lower than that reported in 2022.
The national position statement states that surgical antibiotic prophylaxis duration may be extended to 48 hours for certain categories of surgical procedures: maxillofacial surgery, cardiac surgery, and head and neck surgery. These surgical procedures accounted for one fifth of cases where surgical antibiotic prophylaxis was extended beyond 24 hours, representing appropriate duration of surgical antibiotic prophylaxis.
There is a need for acute hospital surgical and AMS teams to identify local trends and reasons for extending surgical antibiotic prophylaxis beyond 24 hours and target a reduction in inappropriate extension of antimicrobial therapy in these cases. This and further detail available in Appendix A2.5, will support and promote hospital level actions which may include use of audit and targeted education to support local quality improvement.

Need for continued and ongoing AMS resourcing to support sustained engagement in AMS and improvement in antimicrobial use in the acute hospital sector
The forty-three hospitals which participated in the 2024 acute hospital PPS are commended for contributing to this important national antimicrobial stewardship work. The 2024 hospital participation represents a reduction from both ECDC 2023 PPS (65 hospitals)[1] and National Antimicrobial PPS in 2022 (53 hospitals). Feedback gathered from non-participating hospitals showed that the majority reported being unable to participate due to constraints in AMS staff resourcing. It is acknowledged that participation in the larger European study the previous year may have contributed to reduced participation in 2024. Nevertheless, this highlights a need for continued and ongoing AMS resourcing to support sustained engagement in AMS and improvement in antimicrobial use in the acute hospital sector.

3.2. Limitations

The ability to directly compare results from year to year is limited because of changes over time to the inclusion criteria, methodology and number and distribution of participating hospitals.

There were 43 hospitals which agreed to participate in this PPS. This self-selection sampling may lead to a sample of hospitals which may not fully represent the national hospital or patient population. The discordance between this sample and the national population is unknown. The probability of sample bias has increased with the reduced hospital participation rate. Efforts to facilitate and increase hospital participation are ongoing.

In the 2022 acute hospital PPS, for the question, *"what was the reason for continuing the antibiotics beyond 24 hours"* (question 3g), two additional selectable answers existed:

- *"Confirmed/suspected infection diagnosed pre-op/intra-op"*
- *"Confirmed/suspected infection diagnosed post-op"*

These options were removed from the 2024 acute hospital PPS. For certain patients, this modification may have prompted data collectors to report for the question *"Indication code for antimicrobial therapy"* (question 3a) an indication other than surgical antibiotic prophylaxis extended beyond 24 hours (SP3). Compared to previous 2022 acute hospital PPS, in the 2024 PPS this may lead to a slight underestimation of the proportion of surgical antibiotic prophylaxes that extend beyond 24 hours.

3.3. Key recommendations

Key antimicrobial stewardship areas for local improvement identified in the 2024 acute hospital PPS:

- Promote use of Green antimicrobials in preference to Amber and Red antimicrobials where appropriate as per AMRIC Reserve Antimicrobial Policy.
- Sustain and reinforce stewardship efforts to further reduce Red antibiotic prescribing, in particular in Model 4 hospitals. Reserve antimicrobials are last-resort antimicrobials that should only be used to treat severe infections and on the advice of an infection specialist. A target of >90% of prescriptions for Red antimicrobials with infection specialist authorisation (either pre-or post-) is set out in the HSE AMRIC reserve antimicrobial policy.
- Promote timely review and stopping or de-escalation of antimicrobial agents using tools such as Start Smart, then Focus.
- Promote early review of IV therapy with a view to stopping or switching to oral as per AMRIC IV to oral switch toolkit
    - Promote antimicrobial review of all antimicrobials at 24-48 hours after starting, with a view to stopping or changing antimicrobial therapy as clinically indicated
    - Reduce unnecessary use of metronidazole by focussing AMS efforts on reducing unnecessary use of metronidazole in cases of double anaerobic cover.
    - Promote oral use of antimicrobials, in particular agents of excellent oral bioavailability, such as metronidazole.
    - Educate all healthcare professionals on agents of excellent oral bioavailability and early IV to oral switch
    - Educate all healthcare professionals on guidelines regarding IV to oral switch
    - Ensure local mechanisms exist to identify and prioritise timely referral of patients on IV antimicrobials requiring expert antimicrobial stewardship review to switch to an oral agent.
- Focus quality improvement efforts on the treatment of respiratory tract infection
    - Promote adherence of choice of antimicrobial agent with local antimicrobial prescribing guidelines to reduce unnecessary use of broad-spectrum agents such as piperacillin/tazobactam in the context of community acquired infections
    - Promote adherence of duration of antimicrobial treatment with local antimicrobial prescribing guidelines using messaging such as “Shorter is Better,” and “Strive for 5.”
- Continue to reduce surgical antibiotic prophylaxis extended beyond 24 hours in line with HSE AMRIC action plan 2022-2025 target for 2025 of 20% of surgical antibiotic prophylaxis extended beyond 24 hours.[7] Most procedures only require a single dose as per HSE/NCPS National Position Statement.
    - If surgical antibiotic prophylaxis is extended beyond 24 hours, support clear documentation of the reason for extension.
    - Focus AMS efforts on reducing the number of cases where surgical antibiotic prophylaxis is continued inappropriately on the basis that drains remain in place.

- Focus quality improvement efforts on adherence to appropriate duration of treatment for uncomplicated urinary tract infection

To address recommendations outlined in this report, the HSE National AMRIC team will:

- Ensure widespread communication of PPS findings to highlight priority areas for quality improvement.
- Summarise PPS findings in infographic format which is easily understood and highlights key points for all healthcare professionals and healthcare managers.
- Disseminate an individualised regional level report highlighting key AMS indicators to each regional health area.
- Work with stakeholders including healthcare professionals, senior leaders and healthcare managers across the health regions to support collaboration and shared learning.
- Promote and support education and awareness in relation to the national AMRIC Green Amber Red categorisation for antimicrobials in acute hospitals
- Promote oral use of antimicrobials in collaboration with Acute Access and Integration team and the HSE Climate Action Strategy through development and promotion of AMRIC IV to oral switch toolkit to support implementation of IV to oral switch in the acute hospital setting.
- Promote and support AMS focussed efforts on treatment of respiratory tract infections in collaboration with key stakeholders.
- Continue to collaborate with the National Clinical Programme for Surgery and the Royal College of Surgeons in Ireland and establish relationships with relevant speciality groups to build on positive progress achieved to date and maintain a focus on the national position statement on surgical antibiotic prophylaxis duration.
- Provide a tailored surgical antibiotic prophylaxis report and utilise report findings to engage with national surgical colleagues to further direct and drive stewardship in relation to surgical antibiotic prophylaxis.

3.4. Acknowledgements

- We would like to acknowledge the work and input of all the antimicrobial pharmacists and multidisciplinary antimicrobial stewardship teams in the acute hospitals across Ireland who participated in the 2024 acute hospital PPS.
- We would also like to acknowledge the work of colleagues in the HPSC in the analysis and coordination of ECDC Point Prevalence Survey of Hospital-Acquired Infections & Antimicrobial Use in European Acute Hospitals (2023, 2017, 2012, 2006) and previous work coordinating and analysing the national acute hospital PPS.
- We would like to acknowledge the input and collaboration of Chief II pharmacist and colleagues in AMRIC Acute Access and Integration team.
- We would also like to recognise the contribution of members of the National Antimicrobial Consumption Subgroup to the development of the national PPS protocol, report, review and action plan based on the results of the survey.

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A1. Appendix 1

A1.1. PPS 2024 Patient Data Collection Form

5. Patient Data Collection Form (V2.0 – July 2024)

This form is to be used for data collection from all eligible patients included in the study receiving systemic antibiotics or antifungals.

1. PATIENT DETAILS

1a. Subject ID: ☐☐☐☐ **1b. Ward:** ______ **1c. Year of Birth:** ☐☐☐☐

1d. Specialty (tick one): If ADULT MED: ○ SURG: ○ ICU: ○ OBS/GYN: ○ OTHER: ○ If PAEDS MED: ○ SURG: ○ ICU: ○ OTHER: ○

2. DRUGS GIVEN & REVIEW				**3. DIAGNOSIS, INDICATIONS, REASONS**							**4. ON IV**	
2a. Antimicrobial name	**2b. Administration route***	**2c. Current / proposed / completed duration appropriate?***	**2d. Antimicrobial changed? (+reason) ***	**3a. Indication code** (HI1-5/ CI/ LI/ MP/ SP1-3/ UI/ UNK/ O. Table 1, p 10)	**3b. Diagnosis site code** (only if 3a. is HI1 / HI2 / HI3 / HI4 / HI5 / CI / LI, otherwise NA. Table 2, p 11)	**3c. Is antimicrobial choice in line with guideline / micro / ID approved?** (Table 3, p 12)*	**3d. Surgical category** (only if 3a. is SP1 / SP2 / SP3, otherwise NA. Table 4, p 13-15)	**3e. Operative procedure** (only if 3a. is SP1 / SP2 / SP3, otherwise NA. Table 4, p 13-15)	**3f. If surgical prophylaxis for >24 hrs, was there a specific documented reason?** (only if 3a. is SP3, otherwise NA)*	**3g. If 3f is "Y", what was the reason for continuing antibiotics beyond 24 hrs?** (only if 3a. is SP3, otherwise NA. Table 5, p 16)*	**4a. Suitable for oral switch?***	**4b. Patient currently taking any oral medications?***
....	IV: ○ PO: ○ NEB: ○ R: ○	Y: ○ N: ○ MP: ○ NA: ○ UNK: ○	N: ○ OU: ○ E: ○ UNK: ○ D: ○ S: ○ A: ○	....	.... or NA: ○	Y: ○ N: ○ CBD: ○ NG: ○ UNK: ○	.... or NA: ○	NHSN-......... or NA: ○	Y: ○ N: ○ NA: ○	Drain in place: ○ In line with locally approved guidelines: ○ NA: ○	Y: ○ N: ○ UNK: ○ NA: ○	Y: ○ N: ○ NA: ○
....	IV: ○ PO: ○ NEB: ○ R: ○	Y: ○ N: ○ MP: ○ NA: ○ UNK: ○	N: ○ OU: ○ E: ○ UNK: ○ D: ○ S: ○ A: ○	....	.... or NA: ○	Y: ○ N: ○ CBD: ○ NG: ○ UNK: ○	.... or NA: ○	NHSN-......... or NA: ○	Y: ○ N: ○ NA: ○	Drain in place: ○ In line with locally approved guidelines: ○ NA: ○	Y: ○ N: ○ UNK: ○ NA: ○	Y: ○ N: ○ NA: ○
....	IV: ○ PO: ○ NEB: ○ R: ○	Y: ○ N: ○ MP: ○ NA: ○ UNK: ○	N: ○ OU: ○ E: ○ UNK: ○ D: ○ S: ○ A: ○	....	.... or NA: ○	Y: ○ N: ○ CBD: ○ NG: ○ UNK: ○	.... or NA: ○	NHSN-......... or NA: ○	Y: ○ N: ○ NA: ○	Drain in place: ○ In line with locally approved guidelines: ○ NA: ○	Y: ○ N: ○ UNK: ○ NA: ○	Y: ○ N: ○ NA: ○
....	IV: ○ PO: ○ NEB: ○ R: ○	Y: ○ N: ○ MP: ○ NA: ○ UNK: ○	N: ○ OU: ○ E: ○ UNK: ○ D: ○ S: ○ A: ○	....	.... or NA: ○	Y: ○ N: ○ CBD: ○ NG: ○ UNK: ○	.... or NA: ○	NHSN-......... or NA: ○	Y: ○ N: ○ NA: ○	Drain in place: ○ In line with locally approved guidelines: ○ NA: ○	Y: ○ N: ○ UNK: ○ NA: ○	Y: ○ N: ○ NA: ○

* tick one option

Figure A1.1: PPS 2024 Patient Data Collection Form

A1.2. Selected Summary Statistics

Table A1.1: Selected summary metrics by hospital model.

Metric	Model 2	Model 3	Model 4	Private	Specialty (Specialist)	**Total**
Proportion of all patients on antimicrobials (%)	29.7	40.8	42.8	54.6	27.1	**40.9**
Proportion of hospitals participating (%)	50.0	82.4	50.0	75.0	71.4	**68.3**
Proportion of antimicrobials as IV (%)	65.8	67.4	66.0	72.4	73.3	**68.0**
Relative proportions of AMRIC G/A/R AMs (%)						
Green	24.5	23.5	25.3	22.9	25.7	**24.3**
Amber	72.9	72.2	62.5	71.7	67.4	**68.1**
Red	2.6	4.3	12.2	5.4	6.9	**7.6**
Proportion of SAP antimicrobials that are >1 day (%)	25.6	31.5	39.6	22.3	16.3	**26.0**
Proportion of IV antimicrobials switched to oral (%)	8.8	7.5	8.0	5.1	2.8	**7.0**
Compliance of antimicrobial choice with local guidelines or microbiologist/ infectious diseases physician advice (%)	89.9	80.0	87.3	82.5	92.3	**84.5**

A1.3. General details about participating hospitals

Table A1.2: Participating hospitals, by hospital model.

Hospital model	Hospital
Model 2	Roscommon University Hospital
	South Infirmary Victoria University Hospital
	St. Columcille's Hospital
	St. John's Hospital Limerick
	St. Michael's Hospital
Model 3	Cavan General Hospital
	Letterkenny University Hospital
	MRH Mullingar
	MRH Portlaoise
	MRH Tullamore
	Mayo University Hospital
	Naas General Hospital
	Our Lady of Lourdes Hospital
	Our Lady's Hospital Navan
	Portiuncula University Hospital
	Sligo University Hospital
	St. Luke's General Hospital Kilkenny
	Tipperary University Hospital
	UH Kerry
Model 4	Galway University Hospitals
	St James's Hospital
	St. Vincent's University Hospital
	Tallaght University Hospital
	UH Waterford
Private	Beacon Hospital, Sandyford
	Bon Secours Hospital, Cork
	Bon Secours Hospital, Galway

Hospital model	Hospital
	Bon Secours Hospital, Tralee
	Galway Clinic, Doughiska
	Hermitage Medical Clinic, Lucan
	Mater Private Hospital, Cork
	Mater Private Hospital, Dublin
	St Vincent's Private Hospital
Specialty (Specialist)	CHI at Crumlin
	CHI at Temple Street
	Coombe Women and Infants University Hospital
	Cork University Maternity Hospital
	Kilcreene Regional Orthopaedic Hospital
	National Maternity Hospital
	National Orthopaedic Hospital Cappagh
	National Rehabilitation Hospital
	Rotunda Hospital
	Royal Victoria Eye and Ear Hospital