GERMANY:
WELL PREPARED FOR ANTIBIOTIC RESISTANCE?

Gerhard Schwarzkopf-Steinhauser

Senior expert in microbiology, virology and infection epidemiology; former head physician of the clinical hygiene staff unit at the municipal hospitals in Munich

German Concept for AMR

- **IfSG** German Infection Protection Law
- **DART:** German National Action Plan
- **RKI: ARS:** Surveillance of Antibiotic Resistance
- **RKI: AVS:** Surveillance of Antibiotic Consumption
- **RKI:** Infection Control Program
- Laboratories for Microbiology
- Infection Prevention program

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IfSG § 23: Nosocomial infections and antibiotic resistances

- A commission on anti-infectives, resistance and therapy is established at the Robert Koch Institute
  - The commission shall draw up recommendations containing general principles for diagnostics and antimicrobial therapy, especially for infections with resistant pathogens.
- The managers of the following facilities shall ensure that in-house procedures for infection prevention are laid down in hygiene plans:
  - hospitals, facilities of outpatient surgery, Preventive or rehabilitation facilities, Dialysis facilities , Day hospitals, Maternity facilities, Treatment or care facilities comparable to the facilities mentioned above, Outpatient nursing services that provide intensive outpatient care in institutions, residential groups or other community living arrangements, Ambulance services.

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IfSG § 23: Nosocomial Infections and antibiotic resistances

Pathogens with special resistances and multiresistances:

- Continuously recorded
- Evaluated and conclusions are drawn
- The necessary prevention is communicated to the staff
- The consumption of antibiotics are continuously recorded and summarized
- The use of antibiotics will be adapted to the local resistance situation
- The health authority shall be granted access

The German National Action Plan
DART (2008 – 2014)

10 national goals in 4 parts:

- Surveillance-systems for antimicrobial resistance and antimicrobial use

- Evaluation of prevention and control measures to reduce antimicrobial resistance

- Cooperation and coordination

- Research and evaluation

DART 2020

Fighting antibiotic resistance for the good of both humans and animals – and the environment (one health)
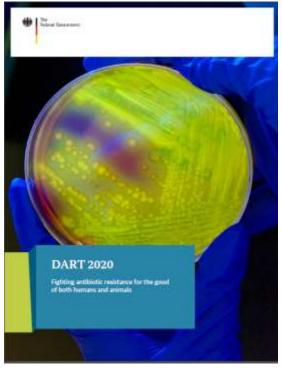
Strategy of

- the Federal Ministry of Health
- the Federal Ministry of Food and Agriculture
- the Federal Ministry of Education and Research

DART 2020

- GOAL 1:
Strengthening the One Health approach nationally and internationally
- GOAL 2:
Recognizing changes in resistance at an early stage
- GOAL 3:
Retaining and improving therapy options
- GOAL 4:
Breaking chains of infection early and avoiding infections
- GOAL 5:
Raising awareness and strengthening skills
- GOAL 6:
Supporting research and development

The Federal Government

DART 2020

Fighting antibiotic resistance for the good of both humans and animals

Hospital antibiotic stewardship (ABS) expert training and network initiative
Promote the responsible use of antibiotics

- To increase the number of physicians and pharmacists with knowledge and skills in rational prescription and strategic antibiotic stewardship activities in acute care hospitals.
- To establish a stewardship expert network for exchange of experience, for continuous education, and as forum for cooperative quality improvement projects
- Financially supported by Ministry of Health

Photo: picture-alliance/dpa/Bernd Wüstneck

The organisations involved in the project:
Abteilung Infektiologie, Universitätsklinikum Freiburg,
Abteilung Infektiologie, Universitätsklinikum Dresden
DGI www.dgi-net.de
ABS-Expertennetzwerk www.antibiotic-stewardship.de

Implementation period: 2010—2013
and 2014—2017

dgi DEUTSCHE GESELLSCHAFT FÜR INFEKTIOLOGIE e.V.

Research Area "Antimicrobial Resistance and Nosocomial Infections" Support of research and development

- Supporting research and development is one goal of the German Antimicrobial Resistance Strategy "DART 2020".
- The research area "Antimicrobial Resistance, Hygiene and Nosocomial Infections" supports its implementation.

Within this activity 11 projects out of four thematic areas were funded over a period of three years.
The projects include results-based intervention studies, the training of specialist staff, model projects for inter-sectoral health care, and the further development of quality assurance.

The organisation involved in the project:
German Federal Ministry of Health
http://www.bmg.bund.de/themen/
praevention/krankenhausinfektionen/
antibiotika-resistenzstrategie.html

Bundesministerium
für Gesundheit

Implementation period: 2012—2015

Research Projects:
RESET - Strengthening the One Health approach
Joint Research Agreement on Zoonoses

■ Collaborative project on ESBL- and (fluoro-)quinolone resistance in enterobactericeae (RESET)

- To determine the prevalence of ESBL-producing bacteria in humans, animals, animal food and the environment.

- To identify the respective resistance genes and analyse their transferability between enterobacteriaceae.

- To compare the genetic relationship of bacterial isolates and resistance gene carrying plasmids in different settings, to evaluate the transmission pathways of ESBL-resistance.

The organisation involved in the project:
Institut für Biometrie, Epidemiologie und Informationsverarbeitung, Hannover

Implementation Period: 2011—2016

RESET
Resistenzen
bei Tier und Mensch -
gemeinsame Forschung in Deutschland

Research Projects:
MedVetStaph - Strengthening the One Health approach Joint Research Agreement on Zoonoses

Goals:

1. To identify the risk MRSA, which emerged in livestock and companion animals, pose to humans.

2. To identify the contribution of clinically relevant antibiotic resistance genes carried staphylococci from animals to antibiotic resistance development in staphylococci of human.

3. To further develop targeted antibiotic resistance surveillance as well as strategies for diagnostics, intervention, and therapy as part of the One Health approach.

Implementation period: 2011—2016

MedVet -Staph
Staphylococcus aureus
als Zoonose-Erreger –
ein Paradigmenwechsel?

GEFÖRDERT VOM
Bundesministerium
für Bildung
und Forschung

The organisation involved in the project:
Institut für Hygiene, Dr. Robin Köck
Universitätsklinikum Münster

DART — Veterinary Issues
Combating and preventing infections
Promoting the responsible use of antibiotics

- Reducing the number of antibiotic treatments of XXX animals to the absolute minimum by improving animal health and strengthening prudent use through legal requirements.

The organisation involved in the project:
Legislator
Federal Ministry of Food and Agriculture

Implementation period: Came into force April 1, 2014

Bundesministerium
für Ernährung
und Landwirtschaft

QS Quality scheme for food:
The food industry's own antibiotics monitoring Strengthening the surveillance system

- Reducing the number of antibiotic treatments in livestock to the inevitable minimum.

- Strengthening prudent use.

- In the QS system, veterinarians have to enter all relevant dat for each single antibiotic treatment of livestock into the QS database.

- All details on this are described in specific guidelines.

- The analysis of this data by QS enables veterinarians and livestock keepers to compare the antibiotic treatments with the average of all farms in the QS system.

The organisation involved in the project:
QS GmbH
https://www.q-s.de/veterinarians/antibioticsmonitoring-veterinarians.html

Implementation period: continuing since 2013

Prescription-only for antibiotics in veterinary medicine
Promoting the responsible use of antibiotics

- In Germany, all antimicrobial veterinary medicinal products are available only on prescription by a veterinary surgeon who in turn is only permitted to hand out prescriptions to owners of animals under his or her care.

- Over-the-counter sale is prohibited.

The organisation involved in the project:
Federal Ministry of Food and Agriculture

Implementation period: ongoing for many years

Bundesministerium
für Ernährung
und Landwirtschaft

Antimicrobial Resistance Surveillance (ARS) Strengthening the surveillance system

- Antimicrobial Resistance Surveillance (ARS) is a laboratory-based sentinel surveillance system with continuous collection of data on antimicrobial resistance for the entire spectrum of clinically relevant bacterial pathogens for both inpatient and outpatient care at national level.
- The major objective is to provide reference data for public use and specific feedback for participating laboratories.

German Surveillance System

ROBERT KOCH INSTITUT

Antimicrobial Resistance Surveillance (ARS) System

- established in 2008 – co-ordinated by the Robert Koch Institute
- laboratory-based – voluntary participation
- data collection:
  - all bacterial species from any kind of sample site
  - from hospital care as well as from outpatient care institutions
- data submission via electronic interface on a daily / weekly basis once a year: data feedback to labs for approval
- coverage (2014):
  - hospitals: 418 out of 1,996 (= 21 percent)
  - practices: 6,920 (8.6 practices / 100.000 inhabitants)
- limitations
  - no clinical information
  - regional representativeness not yet achieved

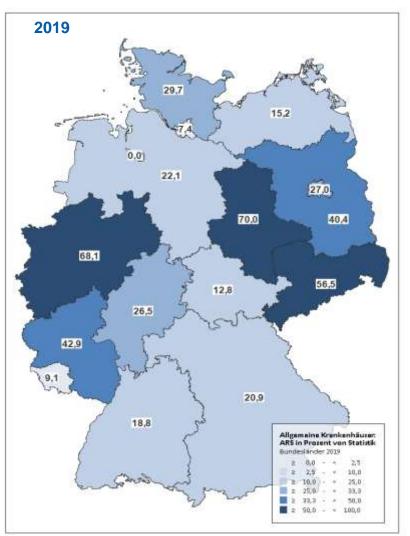3rd Joint Meeting of ARHAI Networks, Stockholm February 2015

6

Implementation period: ongoing

The organisation involved in the project:
Robert Koch Institute   https://ars.rki.de/

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Hospitals Regional Distribution in ARS

2019

Proportion (in %)
general hospitals in ARS
of all general hospitals

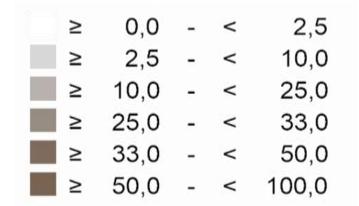|			
≥	0,0	- <	2,5
≥	2,5	- <	10,0
≥	10,0	- <	25,0
≥	25,0	- <	33,0
≥	33,0	- <	50,0
≥	50,0	- <	99,9

ARS Rückblick - Ausblick

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Distribution – doctors' offices in ARS

Number of doctors' offices in ARS / 100.000 inhabitants

≥	0,0	-	<	2,5
≥	2,5	-	<	10,0
≥	10,0	-	<	25,0
≥	25,0	-	<	33,0
≥	33,0	-	<	50,0
≥	50,0	-	<	100,0

Statistic of pathogens in blood cultures

Erregerstatistik

Zeitraum:	2019, 2018, 2017
Versorgungsbereich:	stationär
Region:	Nordost, Nordwest, Südost, Südwest, West
Material:	Blutkultur
Fachrichtung:	Alle
Stationstyp:	Alle
Versorgungsstufe:	Alle

Top 10 Rangliste der Erreger (Bakterien)

Rang	Erreger	Anzahl Nachweise	Anteil an Gesamt		Kummulierter Anteil an Gesamt
	Gesamt	421.496	100,0%		
1	Staphylococcus epidermidis	85.615	20,3%		20,3%
2	Escherichia coli	71.376	16,9%		37,2%
3	Staphylococcus aureus	41.005	9,7%		47,0%
4	Staphylococcus hominis	30.581	7,3%		54,2%
5	Staphylococcus capitis	14.626	3,5%		57,7%
6	Cutibacterium acnes	14.617	3,5%		61,2%
7	Enterococcus faecalis	12.898	3,1%		64,2%
8	Klebsiella pneumoniae	12.731	3,0%		67,2%
9	Enterococcus faecium	9.315	2,2%		69,5%
10	Staphylococcus haemolyticus	8.648	2,1%		71,5%

Staph. aureus blood cultures,
2016, 2017,2018, 2019

Acinetobacter baumanii complex blood cultures, 2016, 2017,2018, 2019

Surveillance of antibiotic consumption (AVS) Strengthening the surveillance system

The objectives of the project are:

- to provide an electronic automated system for the collection, analysis and reporting of antibiotic consumption data in the hospital sector.
- to support the hospitals in the conduct of antibiotics
- consumption surveillance and local antibiotics stewardship efforts
- to build up a national database as a basis for the provision of reference data.
- Participants: 168; Data: 73

The organisation involved in the project:
Robert Koch Institute, Dep. 3, FG37
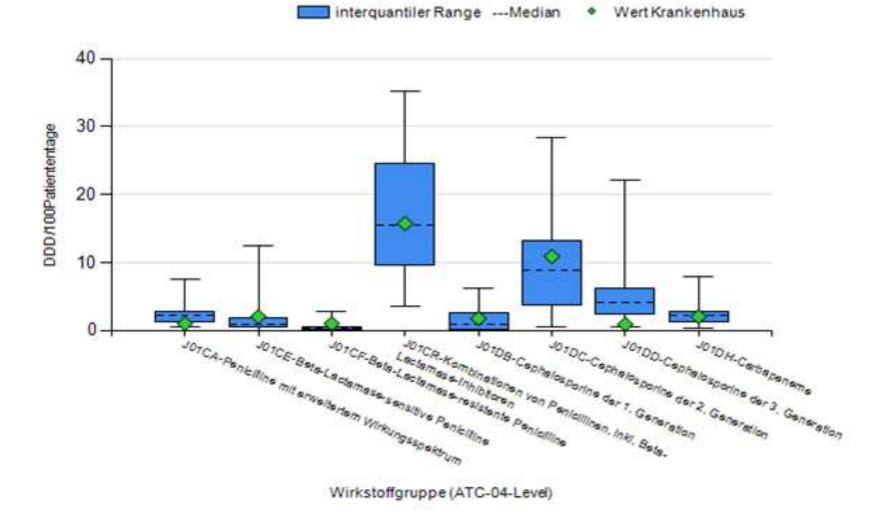www.rki.de
Webside project: https://avs.rki.de

Implementation period: Start of the project: 2013.
Pilot phase: 08—12, 2014.
Routine phase: since 2015

Antibiotika Verbrauch Surveillance

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Antibiotika Verbrauch Surveillance

CHARITÉ
UNIVERSITÄTSMEDIZIN BERLIN
Institut für Hygiene und Umweltmedizin

Antiinfektiva - Report

ATC-Version: 2021

Anzahl Referenzkrankenhäuser: 219 (Anzahl Stationen: 3060)

Jahr/Quartal:	2019 (Quartal 1, Quartal 2, Quartal 3, Quartal 4)
Organisationsebene:	Gesamtkrankenhaus
Organisationseinheit:	Gesamt ohne Pädiatrie/Psychiatrie/Rehabilitation
Stationstyp:	Gesamt (ohne Ambulanz/Tagesklinik)
Verabreichungsform:	Gesamt
Wirkstoffgruppen:	Antibiotika (J01, J04AB02, A07AA, P01AB) alle Ebenen der ATC-Klassifikation
Krankenhausgröße:	< 400 Betten, 400 - 800 Betten, > 800 Betten
Kenngröße:	DDD/100PT
Versorgungstyp:	Gesamt (ohne Fachkrankenhäuser)

Antibiotikum/Antibiotika-Klasse	DDD/100PT				
	Mittelwert	25% Quantil	Median	75% Quantil	Range *
A07AA-Intestinale Antiinfektiva (ohne Antimykotika)	0,34	0,07	0,23	0,43	0,00-3,25
A07AA01-Neomycin	0,00	0,00	0,00	0,00	0,00-0,07
A07AA05-Polymyxin B	0,00	0,00	0,00	0,00	0,00-0,00
A07AA06-Paromomycin	0,02	0,00	0,00	0,01	-0,01-0,46
A07AA09-Vancomycin	0,03	0,00	0,00	0,00	0,00-2,16
A07AA10-Colistin	0,01	0,00	0,00	0,00	0,00-1,30
A07AA11-Rifaximin	0,26	0,03	0,14	0,32	0,00-3,19
A07AA12-Fidaxomicin	0,02	0,00	0,00	0,02	-0,02-0,14
J01-Antibiotika zur systemischen Anwendung	47,59	40,43	47,64	54,56	0,00-71,70
J01A-Tetracycline	0,90	0,47	0,69	1,11	0,00-12,04
J01AA-Tetracycline	0,90	0,47	0,69	1,11	0,00-12,04
J01AA02-Doxycyclin	0,83	0,43	0,62	0,97	0,00-12,04
J01AA07-Tetracyclin	0,00	0,00	0,00	0,00	0,00-0,11
J01AA08-Minocyclin	0,01	0,00	0,00	0,00	0,00-0,24
J01AA12-Tigecyclin	0,07	0,00	0,02	0,08	-0,01-1,02
J01B-Amphenicole	0,00	0,00	0,00	0,00	0,00-0,03
J01BA-Amphenicole	0,00	0,00	0,00	0,00	0,00-0,03
J01BA01-Chloramphenicol	0,00	0,00	0,00	0,00	0,00-0,03
J01C-Betalactam-Antibiotika, Penicilline	17,92	14,38	18,36	21,37	0,00-29,33
J01CA-Penicilline mit erweitertem Wirkungsspektrum	1,59	0,96	1,34	1,93	0,00-4,82
J01CA01-Ampicillin	0,31	0,10	0,23	0,43	-0,02-1,59
J01CA04-Amoxicillin	1,06	0,71	0,97	1,25	0,00-3,67
J01CA08-Pivmecillinam	0,20	0,00	0,00	0,06	0,00-3,42
J01CA12-Piperacillin	0,01	0,00	0,00	0,01	-0,08-0,30
J01CE-Beta-Lactamase-sensitive Penicilline	1,85	0,71	1,70	2,56	0,00-9,38
J01CE01-Benzylpenicillin	1,64	0,61	1,42	2,23	0,00-9,20
J01CE02-Phenoxymethylpenicillin	0,21	0,06	0,15	0,29	-0,01-3,03
J01CE05-Pheneticillin	0,00	0,00	0,00	0,00	0,00-0,00
J01CE08-Benzylpenicillin-Benzathin	0,00	0,00	0,00	0,00	0,00-0,01
J01CE10-Phenoxymethylpenicillin-Benzathin	0,00	0,00	0,00	0,00	0,00-0,14
J01CF-Beta-Lactamase-resistente Penicilline	1,47	0,63	1,20	2,00	0,00-8,01
J01CF05-Flucloxacillin	1,47	0,63	1,20	2,00	0,00-8,01
J01CG-Beta-Lactamase-Inhibitoren	0,07	0,00	0,00	0,00	-0,12-2,84
J01CG01-Sulbactam	0,07	0,00	0,00	0,00	-0,12-2,84
J01CR-Kombinationen von Penicillinen, inkl. Beta-Lactamase-Inhibitoren	12,94	10,10	12,88	15,50	0,00-25,38
J01CR01-Ampicillin und Beta-Lactamase-Inhibitoren	4,56	3,01	4,51	5,88	-0,01-13,03
J01CR02-Amoxicillin und Beta-Lactamase-Inhibitoren	2,90	1,00	2,68	4,34	0,00-11,64
J01CR04-Sultamicillin	0,73	0,00	0,01	1,15	-0,01-6,21
J01CR05-Piperacillin und Beta-Lactamase-Inhibitoren	4,76	3,46	4,63	5,93	0,00-11,13

Antibiotikaverbrauchsdichte des Krankenhauses KRO im Vergleich zu Referenzkrankenhäusern (ATC-04-Level)

Laboratories for Microbiology

- There are many labs in hospitals and

- Get the correct microbiological material

- Do the correct collection of microbiological material

- Quality controlled diagnostic procedure

- Communication of the results

- Quality control system of the whole process

Infection prevention programm

- Hospital hygiene specialists
  - Doctores
  - Nurses
- Hygiene commissions in all facilities
  - presentation and evaluation and the results of nosocomial infections
  - SOPs for infection prevention

Summary

- Regulation in the IfSG

- Germany has a concept (DART)

- ARS and AVS are powerful tools

- Problem: The data in ARS and AVS are not really representative because sending data is voluntary

- Not enough antibiotic experts (in ABS educated doctores in microbiology, pharmacy, treating doctors

- Strong infection control to avoid outbreaks with multiresistent strains

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Thank you so much for your attention!