**Supplementary File 1:**

**Supplementary Table S1.** Uptake of study components across groups

| Component (T2) | Group A (n=68) | Group B (n=67) | Group C (n=49) | Across Groups (n=184) |
|---|---|---|---|---|
| E-learning used % (n) | 84 (57) | 91 (61) | 86 (42) | 87 (160) |
| QC respiratory infections used % (n) | 75 (51) | 88 (59) | 76 (37) | 80 (147) |
| QC urinary tract infections used % (n) | 75 (51) | 82 (55) | 78 (38) | 78 (144) |
| QC pneumonia used % (n) | 69 (47) | 76 (51) | 59 (29) | 69 (127) |
| QC multi-resistant germs used % (n) | 63 (43) | 73 (49) | 59 (29) | 66 (121) |
| Feedback report used % (n) | 90 (61) | 90 (60) | 86 (42) | 89 (163) |
| Background information used % (n) | 93 (63) | 87 (58) | 84 (41) | 88 (162) |
| Patient flyer German used % (n) | 68 (46) | 96 (64) | 74 (36) | 79 (146) |
| Patient flyer foreign language used % (n) | 22 (15) | 49 (33) | 31 (15) | 34 (63) |
| Website used % (n) | 35 (24) | 28 (19) | 27 (13) | 30 (56) |
| P4P used % (n) | 66 (45) | 64 (43) | 37 (18) | 58 (106) |
| Public campaign noticed % (n) | 47 (32) | 49 (33) | 45 (22) | 47 (87) |
| Social media noticed % (n) | 6 (4) | 6 (4) | 8 (4) | N/A |
| Tablet device % (n) | N/A | 33 (22) | N/A | N/A |
| Interdisciplinary QC % (n) | N/A | N/A | 57 (28) | N/A |
| Computerized decision support tool % (n) | N/A | N/A | 31 (15) | N/A |

N/A = not applicable

**Supplementary Table S2.** MAs perspective on integrating study components and newly gained knowledge (T2)

| Integrating study components into practice routines was associated with great effort | Agree | Neutral | Disagree |
|---|---|---|---|
| Flyer German n (%) | 4 (6.9) | 6 (10.3) | 47 (81.0) |
| Flyer Foreign n (%) | 6 (10.3) | 7 (12.1) | 38 (65.5) |
| Website n (%) | 14 (24.1) | 17 (29.3) | 23 (39.7) |
| Social Media Content n (%) | 20 (34.5) | 17 (29.3) | 15 (25.9) |
| Public campaign n (%) | 17 (29.3) | 18 (31.0) | 17 (29.3) |
| Tablet device n (%) | 29 (50.0) | 8 (13.8) | 17 (29.3) |
| | | | |
| **Transferring newly gained knowledge was associated with great effort** | Agree | Neutral | Disagree |
| Content of online training n (%) | 9 (15.5) | 9 (15.5) | 38 (65.5) |
| Content of quality circles n (%) | 13 (22.4) | 16 (27.6) | 27 (46.6) |
| Content of feedback reports n (%) | 13 (22.4) | 14 (24.1) | 30 (51.7) |
| Content of background information n (%) | 11 (19.0) | 14 (24.1) | 30 (51.7) |

**Supplementary Table S3.** Physician perspective on new impulses provided by study components (T2)

| The intervention component provided new impulses | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Agree | | | Neutral | | | Disagree | | |
| | | | | | | | | | |
| Group | A | B | C | A | B | C | A | B | C |
| Online Training % | 48.5 | 59.7 | 40.8 | 25.0 | 19.4 | 18.4 | 22.1 | 16.4 | 34.7 |
| Quality circles % | 72.1 | 83.6 | 79.6 | 14.7 | 9.0 | 10.2 | 10.3 | 3.0 | 6.1 |
| Feedback report % | 58.8 | 65.7 | 55.1 | 30.9 | 22.4 | 34.7 | 8.8 | 7.5 | 6.1 |
| Background information % | 73.5 | 68.7 | 73.5 | 17.6 | 19.4 | 12.2 | 7.4 | 7.5 | 8.2 |
| Patient flyer German % | 35.3 | 53.7 | 53.1 | 17.6 | 28.4 | 24.5 | 39.7 | 14.9 | 20.4 |
| Patient Flyer foreign % | 13.2 | 19.4 | 22.4 | 8.8 | 26.9 | 26.5 | 64.7 | 40.3 | 40.8 |
| Website % | 14.7 | 14.9 | 20.4 | 16.2 | 19.4 | 18.4 | 61.8 | 52.2 | 51.0 |
| Social Media % | 5.9 | 4.5 | 6.1 | 1.5 | 13.4 | 2.0 | 83.8 | 71.6 | 75.5 |
| Public campaign % | 26.5 | 26.9 | 36.7 | 16.2 | 29.9 | 20.4 | 51.5 | 35.8 | 28.6 |
| Pay for performance % | 32.4 | 37.3 | 30.6 | 16.2 | 17.9 | 16.3 | 42.6 | 32.8 | 40.8 |
| Tablet device % | N/A | 9.0 | N/A | N/A | 19.4 | N/A | N/A | 61.2 | N/A |
| Interdisciplinary quality circles % | N/A | N/A | 53.1 | N/A | N/A | 16.3 | N/A | N/A | 20.4 |
| Decision support tool % | N/A | N/A | 16.3 | N/A | N/A | 14.3 | N/A | N/A | 49.0 |

N/A = not applicable

**Supplementary File 2: Interview guide physicians** (translated)

**A – Use of antibiotics**

Describe regular course of action when taking therapy decisions for/against antibiotics regarding patients with acute non-complicated infections

- Influence of patient preferences
- Methods or strategies in use (delayed prescribing?)

**B – Effects of the quality improvement program with regard to patient care**

Support of therapy decisions by provided intervention components

- Which? / Why? / Reasons / necessary changes in daily practice
- Components not used / Tailoring of components to match workflow

Influence of study participation on therapy decisions

- Changes in attitude / Changes in physician-patient conversation

**C- Contextual factors – primary care network**

Structure and offers in your primary care network

Role of network for daily care practice / What has changed since becoming a member?

Reasons for becoming a member

How is peer exchange organized in your network?

- Frequency of peer meetings and exchange / support for daily practice (challenges)
- Information flow / Organisation of information flow
- Information exchange regarding use of antibiotics for acute non-complicated infections

Significance of network membership regarding own course of action concerning patients with acute non-complicated infections

- Possible explanation?

**D- Contextual factors – general**

Further significant factors /developments regarding care for patients with acute non-complicated infections and prescribing antibiotics

- Structural conditions / Organization of processes

**E- Closing**

Recommendations for future use of antibiotics in patients with acute non-complicated infections

- Ideas and remarks concerning a further development of the intervention program

What would you like to tell us besides already discussed topics?

**Supplementary File 3: Interview guide medical assistants** (translated)

**A – Antibiotic management**

Please describe your range of tasks with regards to patient care in practice.

Which experiences did you make in patients with acute, uncomplicated infections?

- Standardized procedures
- Common strategies (i.e. "delayed prescribing" patterns)

**B – Effects of the quality improvement program with regard to patient care**

Support of therapy decisions by provided intervention components

- Which? / Why? / Reasons / necessary changes in daily practice
- Components not used / Tailoring of components to match workflow

Influence of study participation on therapy decisions

- Changes in attitude / Changes in physician-patient conversation

**C- Contextual factors – primary care network**

Structure and offers in your primary care network

Role of network for daily care practice / What has changed since becoming a member?

How is peer exchange organized in your network?

- Frequency of peer meetings and exchange / support for daily practice (challenges)
- Information flow / Organisation of information flow
- Information exchange regarding use of antibiotics for acute non-complicated infections

Significance of network membership regarding own course of action concerning patients with acute non-complicated infections

- Possible explanation?

**D- Contextual factors – general**

Further significant factors /developments regarding care for patients with acute non-complicated infections and prescribing antibiotics

- Structural conditions / Organization of processes

**E- Closing**

Recommendations for future use of antibiotics in patients with acute non-complicated infections

- Ideas and remarks concerning a further development of the intervention program

What would you like to tell us besides already discussed topics?

**Supplementary File 4: Interview guide stakeholders** (translated)

**A – Warm up**

Aspects of interest regarding the use of antibiotics in acute, uncomplicated infections.

- Expectations to the ARena project
- Motivation to participate

**B – Influence on prescribing behavior**

The rationale of the ARena project is to influence prescribing patterns in acute, uncomplicated infections. Where do you see your tasks and responsibilities regarding this topic?

- Facilitators of this rationale

**C- Contextual factors – primary care network**

Structure and offers in your primary care network

Role of network for daily care practice

- Arguments to join PCN
- Reasons for physicians to reject membership in PCN
- Influence of PCN membership on individual decision-making of physicians regarding care of patients with acute, uncomplicated infections

PCNs as a platform of peer exchange. How should this exchange ideally be organized?

**D- Contextual factors – general**

Further significant factors /developments regarding care for patients with acute non-complicated infections and prescribing antibiotics

- Structural conditions / Organization of processes, political developments

**E- Closing**

Recommendations for future use of antibiotics in patients with acute non-complicated infections

Strategies to sustain the goal of a rational use of antibiotics on the long-term

What would you like to tell us besides already discussed topics?