Title: Application of sociotechnical system analysis to the complex problem of antimicrobial resistance

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Introduction:

Antimicrobial resistance (AMR) is a complex problem and one of the greatest threats to public health in the 21st century. There are multiple approaches to addressing this threat, including infection prevention and control, antimicrobial stewardship, and research/innovation. Complex systems such as AMR can be better understood utilizing the sociotechnical framework[1] through analyzing the system elements including goals, people, processes, culture, buildings/infrastructure, and technology. This model reflects mixed-methods research to describe the barriers and facilitators to optimizing system performance across individual, organizational, geographical, and cultural boundaries.

Our study will generate a comprehensive collection of system information to subsequently inform technology development opportunities and knowledge translation interventions that apply to AMR. This research is part of the AMR – One Health Consortium, funded by the Major Innovation Fund program of the Ministry of Jobs, Economy and Innovation, Government of Alberta. Our initial phase of this work will be presented, identifying some of the sociotechnical system (STS) elements that influence the use of antimicrobials in humans and animals.

Materials and Methods:

Scoping interviews were performed with the goal of allowing subject matter experts to steer the research team to promising systems to perform in-depth STS analysis. The study received approval from our Conjoint Health Research Ethics Board (REB20-0156). Participants were

interviewed using a semi-structured interview guide. Participants were influential subject matter experts with seniority, at least 10 years in their specific field. Recruitment was performed though existing networks and referral/snowball networking, aiming for a total of 20-25 participants. Data from the interviews were collected in the form of audio recordings, notes, and a demographics questionnaire.

All data was analyzed using rapid analysis, with the goal of identifying the system ontology and different sub-systems in place. From the system ontology and analysis, scenarios/themes were extrapolated for further analysis for the impact on AMR and potential for interventions in the scenarios.

Results:
We completed 21 scoping interviews. The participants were from various sectors including: animal health (n=11), pharmacy (n=6), dentistry (n=2), and market economics/research (n=2). They varied from academics (n=7) to frontline workers (n=14). Rapid analysis was performed by two researchers independently to ensure inter-rater reliability, and subsequently compiled to identify areas with high saturation of engaged experts and major themes. Data analysis identified most engaged experts were from the animal health and pharmacy sectors. Three common themes considered to have the greatest impact on AMR included: 1) surveillance, 2) technology improvements, and 3) knowledge transfer and breaking "old habits". A limitation is that under-representation from other sectors may have skewed the themes found.

Conclusions:
AMR is a complex problem. The initial phase of our STS analysis employed scoping interviews and identified that awareness of AMR is present, but more action must be taken to combat this issue. Three common overarching themes: surveillance, technology improvements, and knowledge transfer were identified as next steps for the continuation of this stage of our study.

References:

1. M. C. Davis, et. al. 2014. Appl. Ergon. 45;171–180.
2. H. P. N. Hughes, et. al. 2017. Ergonomics. 60;1319–1335.

Tweet
This study applies sociotechnical system analysis to create a collection of system information to inform technology development opportunities and knowledge translation interventions for antimicrobial resistance. #OneHealth #AntimicrobialStewardship