



The intersection of Interprofessional Education and One Health: A qualitative study in human and veterinary medical institutions

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ABSTRACT

Interprofessional Education (IPE) and One Health are two common and overlapping frameworks for teaching collaborative practice. IPE is common at human medical institutions, while One Health is more common in graduate and veterinary programs. The connection between IPE and One Health is still being explored both in scholarship and in real-world professional settings. This prospective, qualitative research study examines the intersection of IPE and One Health at institutions that are members of the Clinical and Translational Science Award (CTSA) One Health Alliance (COHA). COHA consists of veterinary schools partnered with medical institutions through the National Institutes of Health CTSA funding mechanism with the specific goal of advancing the understanding of diseases shared by humans and animals. Twenty-four interviews were conducted with professionals across eight professions. Subjects noted that some of the biggest barriers to IPE education were awareness, accessibility, efficacy, and implementation beyond the classroom. Competency across multiple institutions and a consistent, validated evaluation tool were noted to be lacking. Interviews highlighted a lack of a shared mental model for IPE and One Health across the medical professions, major hurdles for implementation in professional curricula, and a disconnection between bridging IPE and One Health to the workforce and global challenges. Future work in this area may be focused on assessing the IPE and One Health offerings beyond COHA institutions, giving a more holistic understanding on how IPE and One Health are being deployed. One Health can be operationalized through the adoption of IPE principles and practices into curriculum. This research is critical to educate others on current applications, role, and definitions of One Health and IPE. The ultimate goal of this work is to help cultivate transdisciplinary leaders in the human and animal medicine who will have the skills to solve systemic problems.

1. Introduction

Interprofessional Education (IPE) and One Health are two common

and overlapping frameworks for teaching collaborative practice. These concepts describe frameworks in which multiple health workers from different professional backgrounds work together to deliver the highest

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quality of care across settings [20].

IPE is defined as “occasions where learners of two or more professions learn with, from, and about each other to improve collaboration and the quality of care and services” [10]. As outlined by the Interprofessional Education Collaborative (IPEC), interprofessional collaborative practice focuses on four core competency domains (Table 1). The updated 2023 version references One Health within the “Values and Ethics” sub-competency domain. The adoption of these core competencies into accreditation criteria in the United States has increased IPE support at many institutions [15].

One Health has been less ubiquitous than IPE in medical education but is becoming more common in graduate and veterinary programs. One Health competencies have been proposed, that focuses on developing professionals with an understanding of global and local health [17]. The most recent set of competencies builds upon this definition: “One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems. The approach mobilizes multiple sectors, disciplines and communities...to foster well-being and tackle threats to health and ecosystems...” [12]. These competencies are listed in Table 1 [8].

The connection between IPE and One Health has been explored for nearly a decade. When surveyed, medical and veterinary students were unaware of factors that impact health outside of their own discipline [13]. Another study found that in the context of global challenges, an understanding of One Health competencies are critical for MD and DVM students [14]. When veterinary students participated in IPE experiences with other health professional students, there was a demonstrated professional development benefit of interprofessional teams [5]. An article by Kahn et al. (2008) called for “schools of medicine, veterinary medicine, and public health” to “embrace the ‘One Health’ concept ...to meet the challenges of the future” [22].

The application of resources to IPE and One Health curricula in human and veterinary medicine varies. One Health programs are common in veterinary medical schools, but these are rarely linked to IPE. In a survey of veterinary schools, 51% percent of programs had IPE offerings within the curricula [6]. In contrast, the vast majority of medical schools have an IPE program, although it is often human health interprofessional programming (doctors, nurses, pharmacy, technicians) as opposed to IPE outside of the discipline of human medicine. A recent report from the American Association of Medical Colleges notes that nearly 97% of responding colleges required IPE programming [1]. Roadblocks for incorporation of One Health into medical curricula were

Table 1
Comparison of IPE and One Health competencies.

Interprofessional Education competencies	One Health educational competencies
Values and ethics VE1. Promote the values and interests of persons, and populations in health care delivery, One Health, and population health initiatives.	Skills: ● Effective communication ● Collaborative and resilient working ● Systems understanding Values and attitudes
Roles and responsibilities Communication Teams and teamwork	● Transdisciplinarity ● Social, cultural, and gender equity and inclusiveness ● Collective learning and reflective practice Knowledge and Awareness ● One Health concepts ● Theoretical and methodological pluralism ● Harnessing uncertainty, paradox, and limited knowledge
Source: IPEC, 2023	Source: Laing et al., 2023 [8]

lack of One Health understanding and a full curriculum [4].

The SARS-CoV2 pandemic is a key example of synergy between IPE and One Health. From its likely origin in an open-air food market and transmission of disease from animals and humans, SARS-CoV2 provides a powerful illustration of the interconnectedness between humans, animals, and the environment. The SARS-CoV2 response required collaboration across multiple professions, including veterinary medicine, public health, and human medicine. There are other complex problems such as antimicrobial resistance, impacts of climate change on health, and food insecurity, which will also benefit from the breakdown of disciplinary silos and from collaboration across professions [19].

This qualitative research study examines the intersection of IPE and One Health at institutions that are members of the Clinical and Translational Science Award (CTSA) One Health Alliance (COHA). COHA consists of veterinary schools partnered with medical institutions through the National Institutes of Health CTSA funding mechanism with the specific goal of advancing the understanding of diseases shared by humans and animals[2]. This study focused on veterinary and medical schools within the same institution to better understand the different IPE offerings in human medical and veterinary medical programs. It should be noted that these institutions likely have increased awareness of IPE and One Health because of their association with COHA.

2. Methods

We received funding from a COHA Pilot grant to conduct this work. The protocol was approved by the Colorado State University (CSU) Institutional Review Board (Protocol 3430). Participants were recruited from six COHA institutions: Colorado State University, University of Colorado, University of Florida, University of Minnesota, University of Pennsylvania, and University of Wisconsin-Madison. Participants were required to have worked in, conducted research with, or taught coursework on IPE or One Health. Video conference open-ended semi-structured interviews were performed, allowing for flexibility in the interactions with participants [18]. No academic or financial compensation was given to participants.

The semi-structured interview questions were developed within the primary research team and then refined using input from the working group. The interview questions were piloted in two interviews, with minor revisions for grammar and organization. The questions were divided into two major areas: experience with IPE and logistics of IPE delivery (Supplementary Materials). Experience with IPE focused on the participant’s role, how they defined IPE, and how they interacted with IPE. Logistics focused on access, evaluation, and scheduling programming. One Health was specifically integrated into two questions.

3. Data analysis

Four researchers participated as interviewers and as coders. One was a research scientist working in team science, one was a postdoctoral fellow, one was a medical student, and one was a veterinary student. Interviews were conducted virtually via Microsoft Teams or Zoom, then transcribed for coding. Transcripts were analyzed using the constant comparison method [16]. First, researchers read all transcripts separately and open coded using Microsoft Excel to develop initial themes. Then, working together via virtual meetings, researchers employed axial coding to identify the sub-themes of each theme to construct a hierarchical structure. To establish coding validity, manual intercoder reliability was performed. Four interviews (25%) were initially double-coded, with coders working independently without conferral. Cohen’s kappa was calculated retrospectively at 0.603, showing good agreement [11]. SAS v9.4 (SAS Institute Inc., Cary, NC) was used for all statistical analyses.

4. Results

Twenty-four participants completed interviews between May 2022 and August 2022. The de-identified participants are listed in Table 2. Representative quotes organized by research question and theme are presented in Table 3. The coded themes are described below.

4.1. How do you define IPE?

In more than 75% (17/24) of interviews, the participants could not reproduce a full definition of IPE at the institutional level. The most common components of definitions were.

- 1) Two or more professions and
- 2) Working in the same healthcare space.

Many participants emphasized the importance of outcome in any shared definition and working towards tangible solutions to real problems. When asked for a personal definition of IPE outside of their institutional definition, participants were able to easily produce multiple examples. Several participants (21%, 5/24) mentioned the wish for a bigger definition, incorporating “cultural humility” and “healthy equity”.

4.2. What are the challenges in IPE delivery?

4.2.1. Lack of IPE integration within multiple curricula

Allocated time within the curriculum was expressed as a challenge in 54% of interviews (13/24). Participants expressed a belief that IPE should not be an “add-on” but instead a systematic integration. Relegating the IPE curriculum to evenings or weekends would not respect the limits of health professional students, who are routinely “deluged by information.” Curriculum review, both at the institutional and national level, have caused a “density and tightness” to a curriculum that would not allow for easy addition of IPE concepts. In addition, IPE offerings were described as “one-off” or “du jour,” with offerings changing year-

Table 2
List of interview participants by institution and professional degree(s).

Institution	Professional/Terminal degree
Colorado State University	DVM
	DVM
	DVM
	DVM, Ph.D.
University of Colorado Medical School, Colorado State University Campus (CUSOM at CSU)	Ph.D.
	MD
	MD
University of Florida	MD
	Ph.D.
University of Minnesota	DVM
	DVM
University of Pennsylvania	MD
	DVM, Ph.D.
	DNP
	DNP
	MD
University of Wisconsin	DVM
	DVM
	MSW
	PT, Ph.D.
	DVM
	BScN, MScN, PhD

Table 3
Representative quotes from participants organized by research question and theme.

Research question	Themes	Representative quotes
How is IPE defined and structured at institutions that prioritize both IPE and One Health?	Inconsistency in institutional definition	“Professional as an all-encompassing term that includes individuals with the knowledge and/or skills to contribute to the physical, mental, and social well-being of a community” “So we say health ‘professionals’ instead of ‘students’ but otherwise we use the World Health definition. So, ‘when members of two or more health professions learn with, from, and about each other to improve health outcomes.’ And that’s very important to us that we really emphasize the outcomes piece.”
	Personal definitions	“Professional as anyone who contributes one way or another to any aspect of the quintuple aim. And based on that definition, incorporating more students from law, engineering, anyone who could be a part of the broader health team.” “The main challenge is how IPE could be systematically integrated into a curriculum that would not be seen as an add on.” “It’s after hours, so it’s like from 5:00 to 7:00 PM on a Monday and, you know, we already with those three or four classes have, um, group sizes that are over 400 students large.... And the students don’t love it because, well, it’s late on a Monday after they’ve already had stuff, but the curriculums are so tight that getting them to be integrated is difficult.”
What is the potential impact for IPE and One	Lack of IPE integration within multiple curriculums	“I have to confess that it is people who want to do it and it tends to be the same group of us.” “To do so in a team-based learning, there are space constraints...space constraints, constraints in terms of preceptors, who can you know preset multiple types of learners or supervise multiple types of learners.” “I think this gap is hard from academia to the clinical setting. And then the clinic-wide buy-in. I think once you get, learners will do anything right because they want to pass and graduate. So it’s easier to do IPE in school. But how do you, how do you get buy-in, in, in the clinical practice setting...”
	Evaluation strategies	“So how do you in some way evaluate that this whole

(continued on next page)

Table 3 (continued)

Research question	Themes	Representative quotes
Health training and how can it be evaluated?		<p>team collaborating for this patient is improving their care and how do you directly know that it's the IPE team and not all the other things that they may have going on in their life or all the other wrap-around services that they may have elsewhere. So, how do you directly measure it?"</p> <p>"... One of them is accreditation standards, right? And I think, I think this could be a blessing, like if we can figure out how the accreditation standards line up, because everybody's demanding stuff around this..."</p>
	IPE as a tool for the modern clinician	<p>"IPE is the invitation to grow. It is about learning with, from, and about each other... We call it, at my clinic, a dance and it's something we do together in partnership that models flexibility, adaptability, and resourcefulness as we build relationships with each other."</p> <p>"We are ethically responsible to provide all the resources and training, for all students, not just those that want it. There is good evidence that being a member of a cohesive and high-performing team reduces the risk of burnout and job turnover."</p> <p>"I'd say it's essential for their success as future professionals... I think it's essential because healthcare now is so complex. And it really has become a team endeavor... But all professions are recognizing they don't interact with patients or clients in isolation."</p>
	Solving global problems	<p>"I really do think this is how problems are solved."</p> <p>"One of the biggest benefits of this IPE is, 'I don't know the answer to this, but this person probably does so.'"</p> <p>"One Health is a branch of IPE, when two or more professions come together with the shared goal of One Health in an IPE framework. It was also described as 'a device in which to frame IPE problems'"</p> <p>"We have yet to encounter a physician who knows what One Health is because they just don't get trained in it."</p> <p>"I see a lot of colleagues struggle with putting together big research programs or project teams. And it stems from them never having done it before. They do not know how to embark</p>
What is the overlap between IPE and One Health in curricula at these institutions, both inside and outside of the clinical setting?		

Table 3 (continued)

Research question	Themes	Representative quotes
		<p>on meeting people outside the silo. I think IPE and One Health can change that."</p> <p>"That we all work through problems the same, same way and that we all have the same foundation to our education and to our, our goals like they're all foundationally the same and so, like that's, that's the intersection that I see that is, that's best."</p>

to-year or based on faculty interest. Two institutions lauded the value of having a historical agreement for IPE involvement (e.g. "these days, these times, this place").

4.2.2. Lack of buy-in from administration and colleagues

Promotion and tenure committees were noted to not equally weigh IPE activities during consideration for tenure by four participants (17%). Also referenced was a hierarchy of health professions with veterinary medicine, nursing, pharmacy, and social work holding less influence on the IPE curriculum at their institution. Medical school faculty and administrators were perceived to have more influence over the IPE curriculum and its delivery than others. Finally, it was noted that at many institutions it was generally the same group of people ("the people who want to do it") that engaged with the IPE curriculum.

4.2.3. The difficult transition from preclinical to clinical space

Six interviewees (25%) mentioned that the transition from teaching IPE in the classroom to implementing collaborative practice in the clinical setting is difficult. A lack of adequate clinical space was mentioned as a barrier. Participants explained that classrooms allowed for large gatherings of multiple professions, but clinics are sometimes unable to accommodate that many visitors. It was also noted that not all clinical mentors can model collaborative care. As one participant said, "Not all of our practicing clinicians understand IPE enough to cultivate an experience for students in other disciplines."

4.3. How do you integrate competencies and evaluate IPE?

Respondents referenced the IPEC core competencies and stated they were generally "spot-on" and easily incorporated. Two participants pointed out that the national development and implementation of Competency-Based Veterinary Education mirrors Competency-Based Medical Education and that these shared competencies allow for shared objective structured clinical examinations (OSCEs), debriefs, case communications, and coursework. Student feedback was elicited at some point in all programs. Some participants noted that assessment came through formal surveys (5/24, 21%) and others reported that assessment came through student anecdotal stories and reflections (3/24, 13%). Long-term follow-up (five years and beyond) was not integrated into any program.

4.4. What is the potential of IPE?

Collaborative interactions were mentioned in 25% (6/24) of interviews as a tool to overcome imposter feelings or professional perfectionism. References were made about how crucial IPE is outside of the profession in social lives and communities because the skills apply to many situations. A changing hanging healthcare landscape was also highlighted, with a diverse and aging population with increasing affliction from chronic disease and need for psychosocial support.

More than 50% of participants (14/24) described an aspiration to

scale IPE beyond the individual patient. Areas of emphasis in which IPE was noted to be relevant included zoonotic disease, food safety, the opioid crisis, homelessness, antibiotic resistance, and climate change.

4.5. How do IPE and One Health intersect?

All included institutions had One Health programming, either curricular or extracurricular. Some participants (9/24, 38%) noted that IPE activities have been historically limited to those focused on patient care, with a tension between IPE for patient care and IPE for population health. Vital aspects of IPE were described as public health and veterinary medicine. Multiple interviews (8/24, 33%) described a desire for connection between IPE and One Health in curriculum and real-world problem-solving. SARS-CoV-2 was referenced seven times as an issue that brings together physicians and veterinarians, reinvigorating IPE and One Health connections that were not robust pre-pandemic.

The interviews established differences in the prioritization of One Health versus IPE between human health professionals and veterinary health professionals. Human health professionals were more likely to gravitate towards IPE, whereas veterinary health professionals gravitated towards One Health. All medical students and veterinary students at the surveyed institutions had access to IPE curricula, however, this was not always via the curricula. All veterinary students had access to One Health curricula. Only 60% of medical students had access to One Health experiences. In three interviews, participants described the experience of veterinary students in IPE experiences as forced because the activities were not originally designed for veterinary student participation. One Health resonated more than IPE as a term with veterinarians.

5. Discussion

This study examined the intersection between IPE and One Health through qualitative interviews with veterinary medicine and human health educators. Findings suggest the following concepts: lack of a shared mental model for IPE and One Health across the medical professions, major hurdles for implementation in professional curricula, and a disconnection between bridging IPE and One Health to the workforce and global challenges.

5.1. Shared mental model for IPE and One Health

IPE has the potential to provide a pedagogical platform for One Health education [3]. IPE provides the tools for diverse professionals to collaborate and problem solve. The One Health initiative, with its focus on interprofessional collaboration, shares many similar themes with IPE and is widely utilized in veterinary medical education. One of the challenges of IPE is understanding the role of the veterinarian in the broader health care team. Members of the veterinary profession must recognize the larger role they could play, and advocate for their specialized training and skillsets. For example, veterinarians have significant experience with austere care, the human-animal bond, infectious disease recognition, antibiotic resistance, and a wide variety of medical communication scenarios. When participating in IPE, veterinary students may need to acknowledge and share their unique expertise with other team members. Similarly, IPE affords veterinary students the opportunity to expand their knowledge about other professions. The understanding that different viewpoints improve solving complex problems is further enhanced and operationalized with shared awareness of the skillsets possessed by professionals in other fields. The recent inclusion of One Health in the IPEC revised competencies is an important step for developing this shared mental model for IPE and One Health [23].

5.2. Major hurdles for implementation in professional curricula

One Health and IPE competencies cover very broad areas, including teamwork, collaboration, ethics, and problem-solving. This is beneficial in allowing flexibility in developing individual priorities and programs that can involve any number of professional programs that exist at a particular institution. However, a lack of specificity can inhibit recognition of shared purpose, alignment, and collaboration between groups and the accelerated progress that shared efforts promote. The end result is a hodgepodge of IPE and One Health curricular programming with little cohesiveness between the two. These interviews reveal that IPE offerings are robust at the institutions surveyed. Although not the focal point for this research, participants consistently described multiple endeavors to bring IPE and One Health to their students, through courses, curricular activities, and extracurricular experiences. Many barriers to delivery of IPE were also discussed. Some of the biggest barriers were awareness, accessibility, efficacy, and implementation beyond the classroom. Competency across multiple institutions and a consistent, validated evaluation tool were noted to be lacking.

5.3. Connecting IPE and One Health to the workforce and global challenges

The connection between IPE and One Health is still being explored both in scholarship and in real-world professional settings. This study described and compared IPE and One Health curriculum at six institutions with documented commitment to both IPE and One Health. Challenges to implementing IPE and One Health curricula were identified even within this group. Further challenges exist in defining and proving the benefit of IPE and One Health with specific, impactful examples and career opportunities. Experience and awareness is growing, fueled by events during the recent pandemic (e.g. emergency orders allowing veterinarians to administer human vaccinations, veterinary diagnostic laboratories processing human COVID-19 diagnostic tests) and the global impacts of climate change and pollution (e.g. increased spread of infectious diseases, animals and plants as sentinels of toxic exposures) [7,9,21]. Understanding of expertise and established collaborations and trusted relationships between varied professionals and the public resulting from these experiences will help increase the impact and reach of IPE and One Health.

5.4. Limitations

This study has several limitations. First, only COHA institutions participating in an IPE-specific grant were included. For medical, veterinary, and other health professions nationwide, the commitment to IPE and One Health is suspected to be lower. Snowball recruitment can be biased in selection, and not all members of a group have an equal chance of selection. There is an increased risk of error with this sampling strategy. Some of the authors were included as participants in this study, although they did not have a primary role in data analysis (see conflict of interest). Additionally, semi-structured interviewing techniques allow for comparable, reliable data with the possibility of follow-up questions, but the flexibility may impact validity and has a high risk of bias if there are any leading questions.

5.5. Future research

Future work in this area may be focused on assessing the IPE and One Health offerings beyond COHA institutions. Such investigations may give a more holistic understanding on how IPE and One Health topics are being deployed. One Health can be operationalized through the adoption of IPE principles and practices into curriculum. This has largely been theoretical and limited to single programs, but IPE may be leveraged as a platform to deliver One Health education.

Clarifying the perceptions of the value and application of IPE and

One Health within different disciplines could be helpful. The researchers suspect that these perceptions in IPE and One Health will overlap despite some differences based on individual professional priorities and outcomes. Recognition of the value of inclusive perspectives is important in creating sustainable, supported efforts. For instance, veterinarians may consider the One Health terminology critical because of their embedded recognition. The settings of application of IPE and One Health may also vary between disciplines. Clinical accreditation outcomes may be most concerned with clinical interactions, whereas public health programs may be more focused on population-level decision-making. Determining and assessing differences in perspectives among disciplines and finding ways to collaborate may help promote IPE and One Health. It may also be critical assess learning in the One Health and IPE space. Developing these assessments and evaluating programs will also be critical to the importance of IPE and One Health in curriculum and learning.

This research is critical to educate others on current applications, role, and definitions of One Health and IPE. The ultimate goal of this work is to help cultivate transdisciplinary leaders in the human and animal medicine who will have the skills to solve systemic problems.

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CRediT authorship contribution statement

Claire Tucker: Conceptualization, Data curation, Formal analysis, Funding acquisition, Writing – original draft, Writing – review & editing. **Jake Keyel:** Methodology, Data curation. **Amy Blue:** Conceptualization, Methodology, Writing – review & editing. **Ruthanne Chun:** Conceptualization, Methodology, Writing – review & editing. **Amara Estrada:** Conceptualization, Methodology, Writing – review & editing. **Hossein Khalili:** Conceptualization, Methodology, Writing – review & editing. **Anuja Riles:** Conceptualization, Methodology, Writing – review & editing. **Rohini Roopnarine:** Conceptualization, Methodology, Writing – review & editing. **Brian Sick:** Conceptualization, Methodology, Writing – review & editing. **Sue VandeWoude:** Conceptualization, Methodology, Funding acquisition. **Brittany Watson:** Conceptualization, Methodology, Writing – review & editing. **Lauren Wisnieski:** Methodology, Writing – review & editing. **Tracy Webb:** Conceptualization, Methodology, Funding acquisition, Writing – review & editing.

Declaration of competing interest

None.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.onehlt.2024.100767>.

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