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Prevention is better than cure: snakebite education in India.

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Summary

Snakebite remains one of the most neglected of all tropical 'diseases', only recently getting the attention it deserves from the international health community. After the prolonged period of neglect by medical science, this disinterest in snakebite has resulted in a lack of environmental education and awareness among the communities in rural areas regarding measures to improve their everyday life, work, and healthcare. This is the first project in Himachal Pradesh to provide educational awareness to local risk groups and stakeholders. The geographical size and terrain of Himachal Pradesh makes repeated studies unachievable for a small team operating with limited funds. Additionally, independent work undertaken by different groups results in inconsistencies in education and training delivered, making further or wider research impossible due to lack of comparability. There is an urgent requirement for a collaborative approach between existing and new groups. A multi-component and interdisciplinary approach, involving stakeholders in many different realms, should be implemented urgently.

Keywords: snakebite, India, environmental education, antivenom

0 Introduction

Snakebite remains one of the most neglected of all tropical 'diseases', only recently getting the attention it deserves from the international health community (Global Snakebite Initiative, 2018). The World Health Organisation (WHO) added snakebite envenoming to its priority list of Neglected Tropical Diseases (NTDs) in 2009, but removed it in 2013 (Bagcchi, 2015), due to lack of historical snakebite information available regarding the burden and size of the problem in affected countries. It was only re-added in 2017 after considerable efforts and lobbying by a number of key organisations and individuals (Chippaux, 2017). Despite this recent global acknowledgement of snakebite as a NTD, historically little attention has been paid to the subject from the global health community (Gutiérrez *et al.,* 2013) and little work has been done, or funding made available, by the pharmaceutical industry and governments alike. The main organisations addressing snakebite are NGOs such as the Global Snakebite Initiative (GSI), Health Action International (HAI) and Médecins Sans Frontières (MSF).

GSI is an internationally-active, non-profit organisation, led by snakebite experts who are dedicated to improving access to good quality, robustly tested, safe and effective antivenoms in the world's poorest communities (Global Snakebite Initiative, 2018). HAI aims to advance policies that enable access to medicines and rational medicine use through research and advocacy, through creating long-lasting changes to government and industry policies and practices, rather than on temporary solutions. They have instigated a number of country programmes in Africa to address the snakebite burden (Health Action International, 2018). MSF is an international, independent, medical humanitarian organization, which through its Access campaign attempts to bring down barriers that keep people from getting the treatment they need to stay alive and healthy. They advocate for effective drugs, tests and vaccines that are available, affordable, and suited to the people and places where they are needed (Desmaris, 2018).

Globally, an estimated 4.5 - 5 million people are bitten by venomous snakes each year, resulting in about 400,000 amputations and between 20,000 and 125,000 deaths (Gutiérrez *et al*., 2013; Global Snakebite Initiative, 2018). Recent estimates put the number of deaths from snakebite in India at 45,900 per year (Mohapatra *et al*., 2011); afflicting the most impoverished inhabitants of rural areas (Warrell, 2010). The key to clinical management and treatment of snakebites is the timely administration of an appropriate antivenom (Suchithra *et al.,* 2008). However, as toxins in snake venoms vary between and within species, the design, manufacture and administration of antivenom

additionally requires information on the diversity and distribution of venomous snakes and their toxins, which is not currently available in most countries (Gutiérrez *et al.,* 2017).

In India, a single polyvalent antivenom, effective against the venom of so-called 'Big Four' species (Figure 1) is manufactured by five or six manufacturers. The bulk venom that all these manufacturers use in manufacturing the antivenom (or, as it is referred to in India, anti-snake-venom [ASV]) is procured from the Irula Co-operative based near Chennai in Tamil Nadu as this is the only major licensed source of venom. However, large regions of India fall into different biogeographical zones and are occupied by different species. Furthermore, clinical evidence suggests that the current polyvalent antivenom manufactured does not neutralize the life-threatening effects of snakebite caused by the 'Big Four' species in many regions, due to differences in venom composition (Kochar *et al*., 2007, Malhotra & Vasudevan, 2018) or due to antivenom not covering bites of other snake species (Kumar & Sabitha, 2011).

Both the government and other institutions in India, as in many developing countries, have only recently shown an interest in snakebite, yet it is an unusually challenging medical problem that urgently requires further investigation. After the prolonged period of neglect by medical science (Warrell, 2010) this disinterest in snakebite has resulted in a lack of environmental education and awareness among the communities in rural areas regarding measures to improve their everyday life, work, and healthcare (Balakrishnan, 2010). This further increases public fear of snake species, resulting in human-snake conflict, often resulting in killing of many non-venomous snakes on sight.

At the same time, training provided to professionals in the Indian health care system is inadequate in terms of accurate species identification and snakebite diagnosis, the administration of antivenom, treatment of sequelae, and recording of snakebite incidents. In education, teachers are not required to receive environmental education training, with snakebite awareness being absent from the existing school health curriculum (Dasgupta *et al.,* 2014). Prevention of snakebite should be the top priority and is in line with the paradigm shift from a curative to a preventative approach to public health (WHO, 2016; Indian Council of Medical Research, Public Foundation, and Institute for Health Metrics and Evaluation, 2017).

Several citizen-science and scientific studies are being undertaken across India to identify species distribution (Big 4 mapping project, 2017) and geographical boundaries in the venom composition of locally encountered snake species, which will allow identification of regions where specially tailored antivenom needs to be manufactured

and administered. Public education programmes are run by several NGOs to train rescuers in species identification and safe handling techniques, inform local communities of safe practices that reduce chances of snake encounters and bites, and promote environmental education in schools.

This study assessed the efforts currently being undertaken in relation to education practices and general awareness around snakebite in India using the efforts currently being undertaken by a collaboration of local conservation organisations, supported by a research group based at a UK university, in the northern state of Himachal Pradesh. This will help to identify recommendations for the establishment of a national framework based on the guidelines set out by the WHO for the prevention and management of snakebite (Table 1).

1 Methodology

This study employed a critical case sampling strategy. Critical case sampling involves the selection of a small number of important cases to "yield the most information and have the greatest impact on the development of knowledge" (Guetterman, 2015). The sample was extended to include ‘grey literature’ as well as published, peer-reviewed journal articles for two reasons: it captures unpublished and non-commercially published information as well as principal sources of scholarly evidence (Creswell, 2015).

A set of guidelines set down by WHO (WHO/SEARO Guidelines, 1999) and revised by a group of national and international experts to include the most up to date data in the field of snakebite (WHO, 2016), were predominantly produced for medical personnel responsible for treating victims of snakebites. While they discuss how we can move from a curative to a preventative approach through environmental education and awareness, detailed recommendations on environmental education and awareness are not included. However, it is the only official document to sets out standards for the prevention of snakebites in the South East Asian Region. Factsheets produced by HAI & GSI (2018) are framed in an African context, and others deal with specific countries (Organisational Health, Department of Education, Training and Employment, 2013).

Himachal Pradesh was identified as a study area due to a lack of recent thorough herpetological surveys. While it has all the Big Four species present in some districts, it also has both a western and eastern influence with regards to the reptile species present, and considerable climatic and elevational diversity, making it particularly faunistically diverse. Despite the perception that snakebite is not a serious issue in the Himalayan

region, epidemiological studies (Raina *et al*., 2014; Gupt *et al*., 2015) have recorded a significant number of bites, largely by species not included in the polyvalent antivenom preparation. Thus, education aimed at prevention of snakebite is highly desirable. Locations for field work (detailed in Section 2) were identified upon consultation with local medical practitioners, locals and public institutes along with existing snakebite reports from the call to toll free emergency number 108 (Bharti OK et al, 2015). The fieldwork element of this study was undertaken by a multi-disciplinary group that operated together, while working for different projects, between 28 June 2018 and 20 August 2018 in Himachal Pradesh, India. Observations and conversations regarding the WHO guidelines and how they are applied 'in practice' to identify the relationships in snake - human conflict in Himachal Pradesh were recorded by the lead author in a journal during each rest period (day and night).

2 Study Area

The fieldwork centered around four localities within the north-western Indian Himalayan state of Himachal Pradesh. Himachal Pradesh (population ca. 6 million) has a land area of ca. 55,000 km^2, being comparable in size to Switzerland (Allen *et al*., 2016). The state is bordered by the Indian states of Jammu and Kashmir to the north, Uttarakhand to the southeast, Punjab to the west and Haryana to the southwest, and the Xizang Autonomous region of China to the east. At its southernmost point, it also touches the state of Uttar Pradesh. The elevation within the state spans from 450 to 7,000 m a.s.l,, while the climate varies from subtropical in the lower hills through temperate in the lower Himalayan ranges to cold and arid in the higher mountains. The state is characterized by a high dependency on agriculture, together with growing tourism and hydropower sectors (Allen *et al*., 2016).

Time was spent at each of the following four localities;

Great Himalayan National Park (GHNP): Located in the Kullu District of Himachal Pradesh, it covers an area of 754.4 km^2. Declared a National Park in 1999, and added to UNESCO World Heritage List in 2014. The local population (ca. 15,000 – 16,000) in the Ecozone has been identified as being poor and dependent on natural resources for their livelihoods (GHNP, 2018).

Kangra district: Situated on the southern escarpment of the Himalayas, the district contains 3,906 known villages covering an area of 5,739 km^2 (Kangra, Himachal Pradesh, 2018) and a population of ca. 1.5 million.

Chamba district: Chamba district covers an area of 6,522 km^2, contains 1,591 villages and has a total population of ca. 519,080 (Chamba District Administration, 2018).

Mandi district: With a population of ca. 999,777, the district contains 3,374 known villages covering an area of 3,950 km^2 (Mandi, Himachal Pradesh, 2018).

3 Results

3.1 Critical case study

The usefulness of the concept of the "Big Four" snakes of medical Importance in India is yet to be rigorously examined as they are not found in all parts of India (Figure 1), while several other species of cobras, kraits and vipers are present in the northeast and along the Himalayan belt. Even in the south, where all the Big Four are present, the hump-nosed pitviper *Hypnale hypnale* is implicated in a significant number of deaths (Kumar & Sabitha, 2011).

The recognition of new species of medical importance also has great significance in the field of snake antivenom design and manufacture (Mohapatra *et al*., 2011). Although many studies focus on the production of antivenom (not the subject of this paper), little epidemiological or taxonomic research has been undertaken in India. Retrospective analysis of clinical records provide a limited source of information regarding snakebite victims' demographic characteristics and the conditions under which the snakebite occurred. From the few published studies, it is clear that the percentage of bites experienced by males *vs*. females varies considerably across India. Ghosh *et al*. (2008) reported 61 % vs 39 % in West Bengal, India, whereas others have reported 55 % vs 45 % in district of Burdwan, West Bengal, India, and 68 % vs 32 % in Central Karnataka (Hati *et al*., 1992; Kulkarni & Anees, 1994 respectively). In Himachal Pradesh, 59 % male vs. 41 % female (Raina *et al*., 2014) and 46 vs. 54 % (Gupt *et al*., 2015) have been reported from Solan and Kangra districts respectively. Demographic analysis from hospital records in the Bengaluru (Karnataka state) area revealed that men were predominantly the victims of snakebites (Nagaraju *et al*., 2015); however, a study undertaken in Nepal identified females suffering more bites than males (Magar *et al.,* 2013). The variation is not unexpected as it depends on different agricultural practices and allocation of work in different regions: for example, women in hill regions are involved in cutting grass for fodder more frequently (Sawai & Honma, 1976). A geospatial analysis of the results of a national survey conducted in Sri Lanka confirmed that the highest rates

of bites and envenoming were recorded in rural and agricultural areas (Ediriweera *et al.,* 2016).

The bite site also varies considerably depending on agricultural profile (Suchithra *et al.* 2008), snake species, and activity. Some authors have reported percentages of bites to extremities other than the lower limbs of 47 % (Hati *et al*., 1992), 19.4%, (Kulkarni & Anees, 1994). The figures are comparable in Himachal Pradesh, being 36% (Raina *et al*., 2014) and 40% (Gupt *et al*., 2015). Bites occurring on the body (other than the upper or lower limbs) represents bites incurred mainly while sleeping, may reach 20% but is lower in Himachal Pradesh, being 7.4 % (Raina *et al*., 2014) and 0.6% (Gupt. *et al*., 2015). The time of the actual bite also varies considerably. Some authors have reported key bite periods of 18:00 to 00:00 hrs IST while other authors report the daylight period as the most significant time for bites (Kulkarni & Anees, 1994). There was no statistically significant difference in the timing of snakebite in Himachal Pradesh and other Indian states (Raina et al., 2014; Gimkala *et al*, 2016).

Clinical records are a valuable tool of information; however, there is no integrated system to record the circumstances and profile of bites in hospital patients, leading to a lack in community feedback providing guidance to the key risk activities in a given geographical area (Ghosh *et al*., 2008). Studies in West Bengal showed that delays in the presentation of some bite victims to hospitals is directly related to the use of traditional medical healers (Ghosh *et al*., 2008). Plants have been traditionally used by indigenous communities for snakebite treatment in India, such as in the Nath (Panghal *et al.,* 2010) and Oja (Das *et al.,* 2015) communities. Traditional beliefs, proximity to health facilities, and cost of care have emerged as the predominant factors associated with use of traditional healers in similar studies (Newman *et al*., 1997; Schioldann *et al*., 2018). Trust in, and use of, traditional care for snakebite is continuing despite expansion and better access to modern biomedical care.

Although training of medical practitioners in snakebite management has been frequently referred to in the literature, there are limited studies regarding the implementation of protocols that include training and management techniques (Ghosh *et al.,* 2008) as well as for the outcomes of implementation (Inthanomchanh *et al,* 2017). The central conclusion of these papers is that local protocols based on the local situation, snake species and infrastructure with detailed guidelines and training containing practical advice on how to manage snakebite, particularly the effective use of antivenom (Visser *et al*., 2004) is required to adequately prepare doctors to improve treatment and reduce

mortality. National Standard Treatment Guidelines (STG) (Ministry of Health and Family Welfare, 2015) have been published by the Indian Government in consultation with doctors experienced in treating snakebite victims from across the country.

The scale of the socio-economic burden relating to snakebite has rarely been studied. A study conducted in Sri Lanka showed the majority of victims suffered economic loss as a result of long recovery times or disability (Theakston & Warrell, 2000; Williams *et al.,* 2011; Kasturiratne *et al*. 2017). The true burden of mortality from snakebite was found to be similar in magnitude to that of some higher profile infectious diseases; for example, there is one snakebite death for every two AIDS deaths in India (Kumar *et al*., 2010; Mohapatra *et al*., 2011). A study conducted in rural villages in Tamil Nadu, India with snakebite victims identified that the major impact caused by snakebites was the financial burden to the family. Most of the victims were not covered by medical insurance and over 40% needed a loan to cover the expenses of the treatment (Vaiyapuri *et al.,* 2013).

The literature review above, concentrating on the main topics concerning snakebite, identified that although the production of the right antivenom together with appropriate distribution among different areas is the cornerstone to snakebite treatment, there is an urgent need to implement educational campaigns focused on the various stakeholders as well as on the most affected groups (Gutiérrez *et al*., 2017). The fact that most deaths in rural India occur at home, prior to coming to the attention of any qualified healthcare worker, enhances the perception that prevention of snakebite should be the top priority, and is in line with the move from the curative to the preventative approach to public health in India (Jha *et al*., 2006, Kumar & Preetha 2012).

A number of groups, largely NGOs, conduct snakebite education and awareness programmes around the country: these include the National Snakebite Initiative (Tamil Nadu); Save The Snakes (Andhra Pradesh); The Tribe (Goa); Gerry Martin Conservation Education Pvt. Ltd. (Karnataka); Madras Crocodile Trust Bank and Centre for Herpetology (Tamil Nadu), Malabar Awareness and Rescue Centre for Wildlife (MARC) (Kerala), Wildlife Conservation Society (Punjab), Snake Helpline (Odisha), Friends of Snakes Society (Telangana), and Chamaeleon (Goa). To our knowledge, almost programmes currently implemented in India are depended on volunteers and receive relatively limited funding.

Despite the large number of organisations involved in snakebite education in India, and the relatively long time since these activities began, there is little documentation of their

activities or outcomes. A recent study utilizing hospital data in the state of Bihar, India, highlighted the need for locally-relevant community-based education programmes (Longkumer et al, 2016), and their recommendations were subsequently adopted by the WHO (2016) in their snakebite guidelines. They also pointed to the need for evaluation of community interventions to show the most effective practices in reducing snakebite incidence. A study based in the Terai region of Nepal targeted several village for a snakebite awareness programme emphasizing the need for rapid transport of snakebite patients to hospital in combination with the introduction of a motorcycle transport system. Follow-up studies showed a significant decrease in snakebite incidence as well as fatality rates (Sharma *et al*., 2013), suggesting that the programme had increased general vigilance for snakes as an unanticipated side effect. However, other interventions may be less successful. For example, distribution of commercially obtained wellington rubber boots to farmers in Myanmar did not reduce snakebite as they not designed to fit the farmers' feet, which were flattened and broad due to a lifetime of being shoeless (Global Snakebite Initiative, 2018). However, locally produced, specifically designed, boots showed high acceptability among farmers (Tun-Pe *et al*, 2002).

3.2.2 Educational material and Social media

Educational material (posters, stickers, videos and presentations), produced by the team was distributed and communicated to the risk groups and stakeholders as recommended by the WHO, namely local communities of rural areas, children and Forest Department personnel. Stickers displayed the various species of snakes found within Himachal Pradesh, each stating if the species is venomous or non-venomous. Posters highlighted the various precautions to be taken to avoid snakebite, and action to be taken if snakebite occurs (Figure 2).

Wider outreach work used social media platforms, for which two sets of images demonstrating common snakebite scenarios in India were created. The first set (Figure 3) showcased people being bitten in their sleep by common kraits while sleeping on the floor. The painless bite is often not noticed and may result in death or paralysis (often attributed to a heart attack or stroke) by the morning. Early symptoms such as abdominal cramp can be easily confused with other health conditions. These factors result in a delay reaching hospitals and obtaining the required antivenom. The second set of images (Figure 4) displayed a typical Indian kitchen which unfortunately often results in the snake biting defensively.

Both sets of images were followed by emphasizing the following recommendations: keep homes as secure as possible, especially in the evenings; avoid sleeping on the floor and use a well tucked-in mosquito net, keep food stores away from sleeping areas or the main living space if possible; keep rooms clear and uncluttered; always check where you are placing your hands and feet; and in the case of any snakebite, seek immediate medical attention at hospital.

3.2.3 Community involvement and Forest Department training

The team contacted local snake rescuers informing them of the work being undertaken in the State. The team received a positive response from the majority of people contacted, with many individuals informing them when a snake was seen.

Training of Forest Department personnel (Figure 5) included information concerning basic snake biology, common causes of snakebite, basic snakebite first aid, and was reinforced with a practical, hands-on, session to provide basic training in safe handling and removal of snakes from local houses and buildings. This was the first time that they had seen professional snake-handling equipment and received basic training on its correct use. Information about the relocation of rescued snakes, and the desirability of it remaining in its home range (Devan-Song *et al*., 2016; Wolfe et al., 2018), were also communicated. Posters and stickers were provided for reference.

3.2.5 Public Education and Awareness

During the fieldwork, while visiting village communities, it became clear that a very low percentage of individuals were aware that medicine for snakebites is freely available at government hospitals, with the majority of them having never previously heard of antivenom (or ASV). Most villagers also indicated that they perceive every snake to be venomous, apart from a very few species like the buff-striped keelback *Amphiesma stolatum* and Indian rat snake *Ptyas mucosa*, which they know to be non-venomous. 'To be on the safe side', however, they killed even these species on sight. Though protected under Indian Wildlife Protection Act 1972, most of the villagers are unaware that it is illegal to kill a snake.

Through Forest Department officials, we arranged visits to a number of local primary schools. At the schools, discussion started through addressing popular myths from religion and folklore to gain attention. Subsequently, it was explained why these myths are wrong and are just stories. Discussion also concentrated on common childhood diseases, with children asked why they go to hospital if they get malaria (for example)

instead of going to a faith healer. The consensus was that hospitals provide medicine for malaria, introducing the opportunity to explain that they can also get a medicine for snakebite, called antivenom, in hospitals. It was also highlighted that this treatment is provided free in government hospitals in Himachal Pradesh and that free transport to hospitals is also available via the 108 ambulance service. Students were further divided into groups and a representative from each class provided with educational material (posters and stickers) specifically featuring the venomous and non-venomous snakes found in their particular area. Each representative was responsible for displaying and maintaining the educational material within each respective classroom. The monitor was further responsible for classmate engagement in activities.

4 Conclusions and recommendations

This is the first project in Himachal Pradesh providing educational awareness to local risk groups and stakeholders. This study identified the communities that have a conflict with snakes, i.e., farming and others located in rural areas. Discussions took place at every opportunity on how important are snakes from an ecological perspective and the important role that snakes play in rodent control was highlighted. Emphasis was given to children, where stickers helped them distinguish venomous from non-venomous snakes.

The simple ability to recognise venomous from non-venomous snakebites, in the absence of species identification, should be considered in future studies. This ability is crucial in the decision to seek immediate medical attention (Pandey *et al*., 2016). The fear and resentment aroused due to snakebites results in intentional killing of many non-venomous snakes on sight. However, relatively little attention has been devoted to understanding the patterns of snake killing and the impact of such mortality on snake populations (Bonnet *et al*., 1999).

During our interaction with locals and farmers, advice was given on how to mitigate the snakebite problem. Simple measures to make their everyday life easier were recommended, such as lighting toilets at night, using a stick before undertaking any activity close to bushes, cavities or stones, and creating buffer zones between fields and houses. Through the posters, they were introduced to the WHO recommendations for snakebite prevention. Electronic media demonstrated common scenarios leading to snakebites and highlighted prevention measures.

During the study, snake-related religious stories and myths were found to be deep-rooted among locals. For example, while one of the team was explaining that rat snakes do not contain venom in their tail as commonly believed, and that they are completely harmless, the attention of locals was concentrated on a bracelet worn by the demonstrator, which they believed to be a magic talisman preventing the snake from biting him. These attitudes result from many snake charmers, faith healers and priests across India practicing snakebite treatment with the help of objects such as snakestones and mantras. Incidents such as these highlight a requirement for engagement with traditional healers, as they could be effective agents to encourage prompt use of formal government healthcare facilities (Snow *et al.,* 1994; Harrison & Gutiérrez, 2016). It also highlighted the importance of conducting longer-term interdisciplinary research to understand human-snake interactions. Education and conservation strategies should ideally engage students and teachers, who are both key individuals in the process (Kellert, Alves *et al.,* 2014) and be embedded in the school health education curriculum. Airing of snakebite awareness messages on radio and television, begun in Himachal in March 2018, will help increase awareness among communities of the toll-free 108 emergency ambulance system operating in many states in India, including Himachal Pradesh, and the availability of free treatment.

A more detailed understanding of 'risk groups' and their perceptions towards snakes and snakebite would provide knowledge-based, targeted engagement programmes. One would expect that this would lead to more positive and appropriate responses towards snakes, reduced incidence of snakebite and enhanced conservation efforts for snake (Pandey *et al*., 2016, Seigel & Mullin, 2009). Sensitization of locals, through continued orientation programmes within Himachal Pradesh, is crucial to amplify the response experienced during the expedition. At the same time, it is important to develop small appropriately trained teams in every district within the state, to respond to human-snake encounters. The availability of a trained individual during such situations makes a huge difference for the individual or family in crisis, helping to diffuse panic and encourage individuals or families to call an ambulance instead of consulting a faith healer. Training provided to the Forest Department personnel changed their perceptions about snakes alongside increasing confidence to handle snakes using the proper equipment, and can show quick results. A member of the team was recently informed by a Divisional Forest Officer that a snake had been safely removed from a house by staff using the snake handling equipment that had been donated by the team.

The local and national (The Statesman) media showed great interest in the project with more than four articles published, highlighting the importance of the project in snakebite management and emphasizing the fact that people in rural areas are not aware of how to prevent snakebites and of the treatment available in government hospitals. These news reports have drawn the attention of the State Health Minister, who has been quoted as saying that they will look into the matter of snakebite awareness.

Limited literature relating to the feasibility of the WHO recommendations in terms of costs and current practices are currently available. This study identified that Forest Department personnel felt more confident about dealing with a problem snake when equipped properly. Financing provision for equipment needs to be considered in any future snakebite management programme, in addition to training costs for Forestry Department personnel at each location. Geospatial analysis of snakebite cases may help to identify the most cost-effective solution to equipment and training requirements on a district or state level.

The geographical size and terrain of Himachal Pradesh makes repeated studies unachievable for a small team operating with limited funds. Additionally, independent work undertaken by different groups results in inconsistencies in education and training delivered, making wider research impossible due to lack of comparability. There is an urgent requirement for a collaborative approach between existing and new groups. A multi-component, intersectorial and interdisciplinary approach, involving stakeholders in many different realms, should be implemented (Harrison and Gutiérrez, 2016).

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