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Sanitation, Management, Infrastructure, and Space Constraints in Indian Veterinary Institutions: Implications for Animal and Public Health in the Surat Context

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Abstract: ***Veterinary institutions play a pivotal role at the Human Animal-environment nexus. With poor sanitation, space planning, infection control governance and waste management, the impacts are not just on animal morbidity and mortality, but also on the risk to personal health and wellbeing, the risk to clients, risk of environmental contamination and antimicrobial resistance. This paper reworks an early draft that focuses on place and makes it into a defendable narrative review. The analysis does not stand as an audit field study of Surat, due to the lack of auditable field data in the source draft. It, on the other hand, reviews the official Indian data, Indian biomedical-waste guidelines and peer-reviewed veterinary infection-control publications to evaluate the impact that poor sanitation, management, infrastructure and crowding are likely to have on animal and public health in an urban city like Surat with a dense population. Lack of adequate segregation of infectious patients, insufficient hand hygiene, inadequate environmental cleaning, improper sharing, handling of unsafe sharps and biomedical wastes can allow surfaces, equipment, staff work areas and patient pathways to be contaminated as evidenced by the reviewed information. Indian policy documents also reveal that the veterinary institutions are specifically included in the rules for Biomedical waste and also that veterinary services are indeed big business in India and in Gujarat too. The paper suggests that poor veterinary service conditions can also substantially exacerbate zoonotic dangers, healthcare-associated dangers, occupation-related injury or treatment failure. Measures being taking include the establishment of triage and isolation pathways, a secure hygiene infrastructure, standard operating procedures, waste segregation, staff training and regular audits undertaken at local level.***

Keywords: veterinary sanitation, One Health, zoonoses, infection control, biomedical waste, veterinary hospitals, Surat, India

1. Introduction

Veterinary care is not an issue of its own but it is the part of public-health issue. One Health is a concept by the World Health Organization that states human, animal, and environmental health are close interconnections [1]. WHO, FAO and WOAH's Tripartite Zoonoses Guide proposes a multi-sectoral approach is needed to manage zoonotic threats and to achieve this, an integrated practical collaboration at the human-animal-environment interest is essential [2]. The principles are relevant to veterinary schools and institutions as all veterinary hospitals, field units, clinics, and even dispensaries are connected to the same operational chain of infectious materials, sharps, biological waste, companion animals, production animals, and people in the same facility.

The importance of the issue is that it becomes more so in a context of India. The livestock sector in India continues to be the biggest in the world and it materially supports outputs and livelihoods in the country, according to the Department of Animal Husbandry and Dairying [3]. The ability to implement practical, effective, and scientifically sound means to address the specific requirements of a large livestock economy, from disease prevention to treatment through the issues of biosecurity, occupational safety and public confidence, as well as disease surveillance. But the number of institutions builds up is not determining infrastructure quality alone. The type of veterinary institution it is—whether representative of a health protection node or a node of infection transmission- involves the layout of its facilities, the sanitary conditions, staffing, oversight, flow of patients and discipline for infection control. The draft sent for this purpose poses the question- how significant are issues of poor sanitation in veterinary facilities, animal and public health, in Surat due to poor management, infrastructure and limited space. This is a legitimate question, but there are no factual observations, case counts, photos or local audit data that would allow a response based on objective data. This paper therefore takes a clear-cut approach by enacting a holistic view of Surat as a relevant urban context, through the utilization of secondary evidence, explaining the plausible reasons why these inadequacies will be relevant to harm, the most likely avenues of harm to the financial life of B2B enterprises and the institutional responses that are minimally deserving of consideration.

2. Materials and Methods

The method used in this paper is a narrative-review. Data were taken from official, public-health and animal-health documents, Indian Government statistics, Indian documents on biomedical-waste management, peer-reviewed literature in the area of veterinary infection prevention and/or hospital-acquired infections [1-10]. The aim of this was not to provide an estimate of a local prevalence measure for Surat, but to provide a synthesis of credible evidence relevant to four areas of operation raised in the source draft: sanitation, management, infrastructure, and space. The phrases attached to Surat are therefore deΩective (interpretive) instead of quantitative. If direct evidence in the local area is unavailable, the paper does not presume or invent data, but rather says so.

3. Results and Discussion

3.1 Why veterinary sanitation is a public-health issue

Veterinary institutions have multiple ways of transmission: direct contact with animals, indirect contact via cages, work surfaces, sharps injury, contaminated laundry, through aerosol-generating procedures and by traffic of animals between the treatment, waiting room and administration areas. The NASPHV compendium on veterinary standard precautions heavily emphasizes the use of precautions for infection prevention when veterinary staff could be at risk of exposure to body fluids, vomitus, feces, exudates, contaminated surfaces, or nonintact skin [7]. Conveniently located handwashing facilities and administrative controls like required hand hygiene, no recapping of needles, staff vaccination and written infection-control plans are also pointed out as engineering controls in the same compendium [7]. That is, these are not incidental measures to the built environment or the management system, they are built environment and management system tools.

This is consistent with the overall body of evidence. A systematic review of infection-control practices in small animal veterinary settings showed that infection-control practice has been shown to decrease nosocomial and zoonotic infection risk and yet practice is often poor and variable among facilities [8]. Issues identified in the review included hand hygiene practices, handling sharps, cleaning practice, personal protective equipment (PPE) washing and in staff vaccination practices [8]. Proper adoption of good practices was shown to be associated with workplace having infection-control policies, management support, and responsibility assigned to staff member(s) for infection-control in the workplace [8]. This has a direct bearing on the Indian facilities where the three issues—overcrowding, understaffing and informality- may be interdependent.

3.2 How poor sanitation, space, and management create risk

One route of damage is through contamination of the environment. In 2023, a detailed veterinary-hospital study, which faithfully documented faecal contamination at various areas of the hospital, concluded that cross sectional and/or longitudinal monitoring can be useful for meaningful revision of the infection-control in veterinary hospitals [10]. This discovery is significant as contamination isn't contained in visibly soiled areas. Any number of surfaces such as floors, treatment surfaces, keyboards, instruments, corridors, cages and shared equipment can be transfer points wherever the tillage process steps fall short of optimal cleanliness or when clean and dirty tillage flows are not separated.

The 2nd pathway is health facilities infections and Antimicrobial Resistance (AMR). A systematic review of hospital acquired and zoonotic bacteria in veterinary hospitals revealed the presence of organisms in clinical cases, environment and items used for patient treatment and care, as well as high antimicrobial resistance of some of the organisms [9]. This makes the consequences of poor sanitation a lot greater. When the organisms are introduced into the animals, equipment and personnel in the hospital they are a problem, not just one of appearance or convenience. Is transformed into a clinical-risk issue including extended courses of treatment; suboptimal prognosis, increased cost; and increased/never ending containment issues.

There is also a third pathway - spatial. Space issues are important as separation is well known to play an important role in preventing the spread of infection: separation of intake, isolation, treatment/recovery and waste-storage functions; separation of contaminated from clean pathways; and uncrowded waiting areas. The veterinary standard-precautions framework explicitly mentions the isolation of an animal with an infectious disease; environmental infection control, spill response and medical waste management for example are structured operational functions or activities instead of ad hoc activities [7]. Even with the good intentions of trained and enthusiastic employees, a work environment that has poorly implemented safe practices, unable to provide an isolation area, adequate ventilation and handwashing stations, clean up basic storage areas, or simply lacks the discipline of staff in storage areas, cannot reliably ensure that safe practices are followed.

Governance failure – the fourth pathway. Signs of poor management include a lack of checklists, cleaning logs or note takers, inconsistent buying of disinfectants or gloves, lack of someone designated as a person-in-charge of infection-control, inadequate supervision and no written plan for responding to an exposure incident. The systematic-review literature would indicate that having policies, management support and accountable personnel in a facility enhances the efficacy of infection control beyond just based on the goodwill of individuals [8]. Ins and outs of it' is obviously always the issue and often it is not merely the budget size, but the consistency of management that makes a safer and riskier institution.

This provides a straightforward One Health mechanism overview of the interconnections of the pathways (see Figure 1). It depicts how conditions of sanitation can impact at the point of treatment, extend through environmental contamination, occupational exposure, animal stress, antimicrobial pressure and down to community level risk.

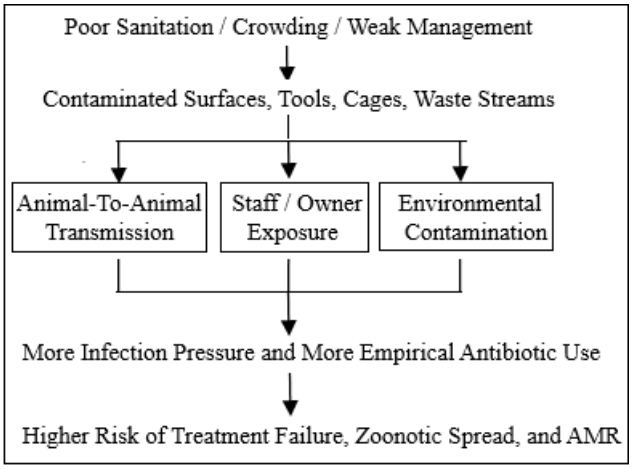

Figure 1: One Health transmission pathway associated with poor sanitation and weak infection control in veterinary institutions (derived from [5-10])
AMR = antimicrobial resistance.

Table 1: Operational domains through which poor veterinary-facility conditions can affect animal and public health (derived from [5-10])

Domain	Typical deficiency	Likely consequence
Environmental sanitation	Irregular cleaning, inadequate disinfection, contaminated floors, cages, instruments, and high-touch surfaces	Cross-contamination, higher risk of healthcare-associated infection, exposure of staff and owners to zoonotic pathogens
Space and layout	Crowded waiting areas, no isolation space, overlap between clean and dirty routes, poor ventilation	Faster contact or aerosol spread, reduced ability to separate suspected infectious cases, stress on animals and staff
Waste and sharps handling	Improper segregation, unsafe storage, delayed disposal, weak spill response, sharps mismanagement	Needlestick injury, environmental contamination, regulatory non-compliance, wider community risk
Management and workforce	No written infection-control plan, inconsistent PPE use, weak training, no monitoring or audit	Variable compliance, avoidable exposure incidents, poor outbreak response, persistent unsafe routines
Antimicrobial stewardship	Weak hygiene leading to preventable infection pressure and repeated empirical antibiotic use	Higher probability of resistant organisms, treatment failure, and increased public-health concern

3.3 Indian institutional context and relevance to Surat

The magnitude of the service system in which the local facilities function can be gauged by official Indian figures. According to a reply given in the Rajya Sabha on March 19, 2025, there were 53.57 crore livestock in the country as per 20th Livestock Census and as of March 31, 2024 there were 67,889 veterinary institutions, including 13,173 veterinary hospitals/polyclinics, 30,184 veterinary dispensaries and 24,532 veterinary aid centres [4]. The same answer was reported that Gujarat operates 127 veterinary mobile units in the Livestock Health and Disease Control Programme with 2064 veterinary institutions [4]. While these numbers speak to reach, they do not speak to the quality of the programmes or design of the workflow or sanitation performance at the local level.

Figure 2 adjusts the numbers of institutions at the national level to a proportionate display. The biggest percentage of services in the service network belongs to dispensaries, followed by veterinary aid centres and hospitals or polyclinics. The policy implication is that infection control capability has to be a problem that the tertiary hospital cannot resolve on its own, but rather is one that lies across the broader every day service chain.

Figure 2: Distribution of veterinary institutions in India as of March 31, 2024, based on the Rajya Sabha reply [4]

Type of Veterinary Institution	Number	Percentage
Veterinary dispensaries	30,184	44.5%
Veterinary aid centres	24,532	36.1%
Veterinary hospitals/polyclinics	13,173	19.4%
Total veterinary institutions in India	67,889	100%

Bar lengths should be proportional illustrations, not the actual width of the plot (percentage bar shares).

As per the environmental laws in India veterinary practices have also been recognized as a small biomedical waste producer. The Bio-Medical Waste Management Rules made applicable by the Central Pollution Control Board (CPCB) apply to any institution generating, collecting, storing, transporting, treating or disposing biomedical waste which also explicitly mentions veterinary institutions [5]. Annexure X to the annual reporting system laid out by CPCB under the 2016 rules [6] further bring a focus on the segregation, collection, treatment and disposal obligations in the rule. Why is this important? Sanitation is NOT just a housekeeping problem in the veterinary setting, it has a compliance angle which is a matter of occupational safety, environmental health and public responsibility!

Concluding cautiously in Surat only, when this is present places it likely to have relevant impacts on the local facilities, especially when at high use for companion animal, stray animal and peri-urban livestock cases where poor

sanitation and space availability is involved. But, the existing evidence base to this task does not allow for a statement like "Surat facilities are worse than those in Mumbai or Delhi. Such a comparison in a responsible way would require a well organized field audit, a uniform checklist facility, patient flow and cleaning observations and, if possible, microbiological samples. In this way came into light the academic state of the rightful state: mechanism of harmful action had become more and more well supported, magnitude in the locality to be confirmed.

3.4 Recommendations for institutions and local authorities

All veterinary hospitals, dispensaries and bigger clinics should have a written infection control plan with a designated responsible officer. The plan should at least include categories for hand-hygiene locations, personal protective equipment (PPE) guidelines, handling of sharps, how often surfaces will be cleaned, spilling, when to put a person in isolation, reporting of exposure, and sanitizing check at the end of the day [7,8]. Written systems are important as it takes a good intention and makes it repeatable routines.

Second, in order to maximize space, space needs to be reconfigured in response to patient processes. Suspected infectious cases should be immediately triaged and directed to a separate holding or treatment area as far as possible. Everything that has contact with contaminated wastes at the movement pathway, including contaminated linen, follow-up works, medical wastes such as blood, etc. must be cleaned first. In even the smallest engineering changes, like hand washing stations at important locations, clearly marked waste bins, improved ventilation, washable surfaces, and labeled clean and dirty areas, can be beneficial to safety when money is scarce [7].

Third, the issue of biomedical-waste governance needs to be placed in the non-negotiable segments of public-health governance. Veterinary institutions should adhere to the “colour coded” segregation and other security requirements of safe storage, transport and disposal as specified under the Bio-Medical Waste Management Rules and guidelines of CPCB [5,6]. This includes regular audits of Sharps containers, Sharps storage area and schedules for the waste collection.

Fourthly, there needs to be a connection between hygiene improvement and staff training and antimicrobial stewardship. It is important that facilities do not just train staff once, check compliance and look at antibiotic usage trends in correlation to the lack of cleanliness. The literature shows that the issues of poor infection control and resistant organisms are not two different issues but intertwined [8,9].

Lastly, a local veterinary facility audit should be conducted in Surat, or whichever city is of interest, through a One Health perspective. Facility mapping and sanitation scoring, patient-flow observation, waste-management verification and staff interviews, and possibly environmental microbiologic sampling, should be included in such an audit. This will shift the current question from a likely risk assessment, to an empirical study.

Table 2: Suggested audit indicators for a future Surat-based veterinary facility assessment

Audit domain	Example indicators	Evidence to record
Cleaning and disinfection	Cleaning schedule present, disinfectant concentration documented, high-touch surfaces visibly clean, spill kit available	Checklist score, photographs, cleaning logs, product labels
Layout and patient flow	Separate intake and treatment pathways, isolation area available, clean and dirty zones marked, ventilation adequate	Floor plan sketch, observation notes, crowding count at peak hours
Hand hygiene and PPE	Functional sinks or sanitizer points, glove supply, mask or apron availability, staff compliance during observation	Inventory record, spot-observation sheet, staff interview
Biomedical waste and sharps	Colour-coded bins present, sharps containers not overfilled, secure temporary storage, disposal tie-up documented	Waste audit form, storage photographs, manifest or pickup records
Governance and training	Written infection-control SOP, named responsible officer, exposure-reporting process, recent staff training session	SOP copy, attendance register, incident log, interview notes

4. Conclusion

Lack of sanitation, management, infrastructure and space at veterinary institutions can have a new, real impact on animal and public health. There is evidence of clear pathways in harm by increased environmental contamination, loss of isolation of infectious cases, unsafe handling of waste and sharps, occupational exposure, and increased circulation of hospital acquired or resistant organisms. These are not cosmetic issues in the Indian context where veterinary services are used to service a very large livestock economy and where a clear set of biomedical-waste rules exists. In Surat, the academically defensible conclusion is that the risk is possible and may be significant however there would be a need for more structured field verification for the extent of the risk in the local area. In the absence of such information, it seems that the best thing to do is to increase the minimum standards for sanitation and infection control at all veterinary institutions, instead of relying on ad hoc practice.

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