Integration of consultation services, technical services, and product sales by veterinarians in production medicine will financially benefit bovine veterinary practices, enhance the productivity of cattle populations, and increase the profitability and economic efficiency of clients' operations.

**Identify the Veterinarian's Mission Statement**

The veterinarian's interest and desires and special competence and talents are in production medicine for cattle populations. The veterinarian is to help clients achieve production goals by the tailored use of the
latest technology.

**Identify the Client's Mission Statement**

The client's interest and desires are to implement production and environmental health management practices to foster optimum health and well-being of a cattle population unit and to enhance their productivity and economic efficiency.

**Establish the Veterinarian-Client Relationship**

The desire and full cooperation of the client and veterinarian are of critical importance to the success of a health management plan. Veterinarians' time costs money, so they have to receive adequate compensation. They must also make a profit while they have to provide cost-effective services and products. The procedures they recommend and the management they employ all must be profitable to the client. The veterinarian-client relationship is a business, but yet can be a friendship. Ethical and responsible veterinary practice with respect and a caring attitude is provided. Dispensing drugs and biologicals and selling supplies are an integral part of production medicine practice. Prices have to be competitive and current to prevent lay distribution from undermining the relationships with clients.

**Maintain Continuing Education**

The veterinarian obtains knowledge of the industry of cattle populations in production to be able to relate to the implementation and the cost-effectiveness of health management practices. To be knowledgeable and comfortable with the vertical and horizontal integration of the cattle industry, the veterinarian listens to the clientele and participates in educational activities of lay organizations by reading their publications and attending their seminars. New and advanced technology that can be integrated in production medicine is continually available to the veterinarian through veterinary publications and seminars. Continuing education is a must. The need of the client in cattle production is for the veterinarian to provide the latest technology through counseling, consulting, and outreach education. The consultation service transfers art and science information to clientele. Evaluation of the new information determines the profitability of the provided technical services and product sales.

**Achieve The Client's Goals**

The veterinarian helps the client achieve production goals, and the first priority is to set a particular goal or set of goals that can improve production. An individualized health management plan designed to accomplish the goals is established. To be considered in this plan are many factors such as population animal health, reproduction, nutrition, environment, genetics, marketing, and production and financial records. Furthermore, the interaction between these factors are considered in the design. Professional people with specialized areas of knowledge are invaluable to the veterinarian. An integrated team of specialists, including veterinarians possessing specific expertise, university, diagnostic laboratory and allied industry personnel, nutritionists, and accountants and bankers, may be necessary to develop a health management plan and to evaluate productivity and profitability.
Evaluate Services and Products Provided
Improvements in a client’s profitability encompass multiple interrelated factors. The weighted emphasis placed upon each factor must produce the desired result, yet be cost-effective. As management practices are increased, the response to a practice (input) rises at first then begins to decline, reaching zero, the point of maximum benefit. Maximum profit is obtained when the money return obtained from the last unit of input just equals the cost of adding it. For each previous unit added, the return would have exceeded the cost. For each subsequent unit, the cost would exceed the return. Further practices produce reducing responses. Evaluation of the tailored health management plan’s impact on the operation as a whole and periodic reviews to examine progress and unplanned developments are provided by the veterinarian’s consultation services to the client. Counseling with an integrated team of specialists again may be necessary.

Implement Marketing Strategies
The veterinarian sells production medicine to cattle producers. The veterinarian develops relationships in the cattle industry community by participating in the programs of Cooperative Extension Service, cattle associations, cattle shows, fairs, exhibitions and sales, agribusiness organizations, lending institutions, and regulatory agencies. Client education is provided by participating in such programs and in addition by other methods of outreach education such as presentations (client seminars), publications (magazine articles, newsletters, and information sheets), and mass media (radio, television, and newspaper). Relationships, commitment, and communication are keys to the success of a production medicine veterinarian.

Conclusion
Whether a veterinarian provides consultation services, technical services, and product sales to a small or large to a small or large cattle operation, the veterinarian thinks population, production, and profit. Progressive cattle producers know the "same old stuff" that has become routine to them through education and experience over the years. They seek production medicine veterinarians for advice, services, and products based on the latest technology. Money is what production medicine is all about. The basic philosophy is do enough of the right things, at the right time, to improve production and profits. Use of qualified accountants and decision support tools is necessary to evaluate the economic impact of the individualized health management plan for the producer and the compensations for the veterinarian.
**Synonyms:** herd health, preventive veterinary medicine, health management, health and production management, *performance medicine, population medicine*

**Objectives:** maintain and improve animal **health** and **well-being**
- control disease and improve production
- produce at the most efficient level
- biological efficiency

maintain and improve **productivity** of the farm business
- ensure actual production meets expectations
- obtain optimum production
- biological efficiency

maintain and improve **profitability** and **economic efficiency** of the farm business
- focus on financial performance of the farm
- provide maximum economic returns

maintain and improve **hygiene** of the farm’s production
- produce wholesome food at a reasonable price to the consumer
- produce wholesome food yielding a net profit for the producer

determine producer’s **goals, values, and needs**
- develop objective criteria that can measure progress and results in a population

integrate **health management** plans with **production** and **management**
- create data bank for production planning and prediction
- conduct statistical and financial/economic analysis for simultaneous measurement and assessment

**Suboptimal performance:**
clinical disease
subclinical disease
management inefficiency/inadequacy

**Success:** quality of producer’s management **skills**
producer’s **desire** and **ability** to comply with veterinarian’s recommendations
keeping good **records/record system**
- monitor health events
- monitor levels of production
- monitor incidence of disease
- compare targets of performance with actual performance

integration of health and production management
- identify **problems**
- formulate cost-effective corrective **actions**
apply information to solutions
· evaluate responses
· make data-based management decisions
· make decisions based on comparisons of other farms
· place more emphasis on management factors than on treatment of disease
  ➢ production economics
  ➢ nutrition
  ➢ reproductive performance
  ➢ housing and environmental management
  ➢ clinical epidemiology
  ➢ infectious disease control
  ➢ marketing
computing data analysis
· based on selection of parameters required to monitor performance accurately
· report results back in numerical and financial terms
  ➢ provide financial values for measured production gains
· report warnings of deviations from set targets and goals
  ➢ production performance
  ➢ disease prevalence
resulting in economic benefits
· consider costs and benefits of veterinary services
  ➢ whether the expenditure provides the best economic return
  ➢ veterinary services do not have a cumulative benefit
· producers purchase goods and services based on their cost and the potential return generated by their use
· limited information on economic benefits that can be realized from production medicine
· economic impact of medical decisions is not certain in most cases
  ➢ paucity of data
· more cost effective as populations become larger

Costs: on-farm professional services
data analysis and report preparation professional time
drugs, vaccines, and supplies
travel
telephone charges

Traditional fee methods:
charge per professional hour (hourly fee)
charge per head per unit of time (annual fee per animal)  
contract charge for all professional services (annual salary)  
  · percentage of profits possibly included  
additional charges for supplies, travel, and telephone

Traditional fee basis:  
cost-based pricing  
  · charge based on cost of professional services and products  
market-based pricing  
  · charge based on demand and difficulty of professional services

Targets of health and production performance:  
optimum levels that yield the best economic returns on investments  
  · related to purpose, not to disease

Shortfalls in performance:  
performance-related diagnosis (inadequate performance)  
  · differences (deviations) between targets (expected levels) of performance and actual performance  
  · interaction of management, environment, animals, and pathogens

MATHEMATICAL/STATISTICAL TECHNIQUES FOR PRODUCTION MEDICINE

Mathematics is a tool:  
to summarize and clarify data  
to test the truth of conclusions  
  · mean  
  · standard deviation (variance, estimates of risk)  
  · confidence interval (attitudes to risk)  
  · confidence level  
to quantify the financial impact of biologic events

DECISION ANALYSIS FOR PRODUCTION MEDICINE

Decision analysis is a tool:  
to help ensure that appropriate decisions are made  
  · systematic decision tree process  
  · graphic model for probabilities of expected outcome events (values)  
to determine potential economic impacts of choices (interventions)  
  · quantitative approach to decision-making process

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to determine break-even points between decision sequences  
  · sensitivity analysis (technique)  
  · break-even curves compare two intervention strategies  
  · break-even curves examine value of intervention over nonintervention
PARTIAL BUDGETS FOR PRODUCTION MEDICINE

“Standards for production effects (outputs) are unacceptable due to variability in environment, animal, and management.”

**Projection:** project the nonstandard value of a program strategy in the future
- regarding effects of disease and management on productivity
- specify courses of action and responses
- make **income** and **expense projections** about the outcome of an event
- demonstrate the effect of factors in monetary terms
- value all implications of a change
- increase the amount of each input until the last additional unit produces the same value in output
  - point of maximum benefit
  - each subsequent unit, cost exceeds return

**Comparison:** compare the nonstandard values of two or more programs (economic comparisons)
- current program values
- proposed program values

COSTS OF DISEASE (ECONOMIC EFFECTS) IN PRODUCTION MEDICINE

**Biologic effects:**
- **reduced productivity** and efficiency
  - express morbidity, mortality, and production loss in physical units
  - express morbidity, mortality, and production **loss in dollars** at current market price
  - low animal value, little consequence
  - high animal value, catastrophic impact

**increased preventive and therapeutic inputs**
- drugs, chemicals, vaccines, and supplies
- veterinary services

**increased labor inputs**

CONTROL OF DISEASE IN PRODUCTION MEDICINE

**Increased revenues:**
- increased reproductive efficiency
- increased amount of product
improved weight gain
improved feed efficiency

**Decreased revenue losses:**
- reduced deaths
- reduced culling rates
- reduced market channel loss
- reduced genetic value loss

**Reduced expenses:**
- decreased veterinary service costs
- decreased drug, chemical, vaccine, supply costs
- decreased feed costs
- decreased replacement animal costs
- decreased labor costs

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**ECONOMIC ANALYSIS/VETERINARY ECONOMICS IN PRODUCTION MEDICINE**

**Economic analysis is a tool:**
- to evaluate the past
- to quantify or describe the present
- to predict or **plan the future**
- to conduct repeated **cost/benefit analysis (technique)**

Economics is about making efficient choices (**a science of choice**) accountancy is about calculation and interpretation of financial values

“Forecasting is like trying to drive a car blindfolded, following directions given by a person who is looking out of the back window.”

**Types:** partial budget
decision analysis
capital budget
simulation

**Measures:** reveals approximations
involves assumptions

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**Objectives:** determine losses
- economic impacts
- biologic impacts

**draw conclusions**
- recommendation for action
- solution to a problem

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**determine motivation** to increase production and profit

**reduce risk**
- predict bad outcomes (probabilistic and low visibility)
- utilize “minimax” approach
  - minimize the chance that the maximum bad outcome occurs

**set time horizon**
- determine time limit within which economic analysis is made

**determine revenues (outputs)**
- calculate **value of product**
  - product times price
  - little control
- determine production effect of a program
  - low visibility

**determine expenses (inputs)**
- types of costs (most control)
  - **fixed costs**, costs regardless of which choice or action is taken
    - costs regardless of production level
  - **variable costs**, costs depending on what actions are taken
    - costs vary with production level
    - costs dependent on production level
  - **cash costs**, costs annually for purchased inputs (high visibility)
  - **opportunity costs**, costs by not making some other choice
    - return foregone by not using resources elsewhere

**calculate profit of farm** before and after interventions
- revenue (output) - expenses (input) = **profit** (VALUE)
- calculate **net increase** in profit of farm after interventions
- calculate **percentage increase** in net profit of farm after interventions

**calculate economic efficiency/performance** of interventions
- revenue (output) ÷ expenses (input) = **efficiency** (VALUE)
- a criterion to use in judging the desirability of alternative methods
  - benefit: cost ratio (rate of return)
  - should be greater than 1
  - rates of returns not cumulative

**calculate economic efficiency** of farm before and after interventions
- calculate **net increase** in economic efficiency of farm after interventions
- calculate **percentage increase** in economic efficiency of farm after interventions

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**VALUE-BASED PRICING IN PRODUCTION MEDICINE**

**Objectives:**
- be involved in decision-making process in farm business
- learn to **evaluate economic benefit** of interventions
  - demonstrate their impact
  - document value of technical and consultation services
- be compensated on financial improvement and rate of return
Fee basis: charge not based on cost of professional services (cost-based pricing)
charge based on values of professional services (value-based pricing)
  · net profit payment
    ➢ a percentage of net increase in profit of farm business
    ➢ net increase in profit in response to a choice (intervention)
    ➢ percentage increase in net profit x net increase in profit + interest = FEE
  · marketing justifications
    ➢ degree of difficulty
    ➢ degree of demand/scarcity
    ➢ increase in economic efficiency
  · hourly fee = fee ÷ hours spent
### Theoretical Calculations of Comparisons for Adjusting Fees Based on Values of Veterinary Services for Interventions

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<th>$Output</th>
<th>$Input</th>
<th>$Profit(P)</th>
<th>$Output</th>
<th>$Input</th>
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<th>_P $</th>
<th>%_P</th>
<th>EE</th>
<th>%_EE</th>
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</table>

1 Input is reduced in two comparisons:

A6 10,000 reduction in expense
C1 2,500 reduction in expense

2 Time horizon of interventions of comparisons is three years.

3 Interest is not included in calculated fees.

**Economic efficiencies of interventions of comparisons are not cumulative:**

A1 11,000 : 1,000 (11:1) - 1 Intervention
A2 11,000 : 1,000 (11:1) + 11,500 : 500 (23:1) = 14:1 (21,500 : 1,500) - 2 Interventions
A3 11,000 : 1,000 (11:1) + 11,500 : 500 (23:1) + 10,250 : 250 (41:1) = 18:1 (31,750:1,750) - 3 Interventions
A4 11,000 : 1,000 (11:1) + 11,500 : 500 (23:1) + 10,250 : 250 (41:1) + 10,250:250 (41:1) = 21:1 (42,000:2,000) - 4 Interventions
A5 11,000 : 1,000 (11:1) + 11,500 : 500 (23:1) + 10,250 : 250 (41:1) + 10,250:250 (41:1) + 11,000:1,000 (11:1) = 18:1 (53,000:3,000) - 5 Interventions
B1 1,500:500 (3:1) - 1 Intervention
B2 1,500:500 (3:1) + 1,750:250 (7:1) = 4:1 (3,250:750) - 2 Interventions
B3 1,500:500 (3:1) + 1,750:250 (7:1) + 3,250:750 (4:1) = 4:1 (6,500:1,500) - 3 Interventions