Session 1:

Nicotine Dependence

State the 3 stages to treating tobacco smoking:

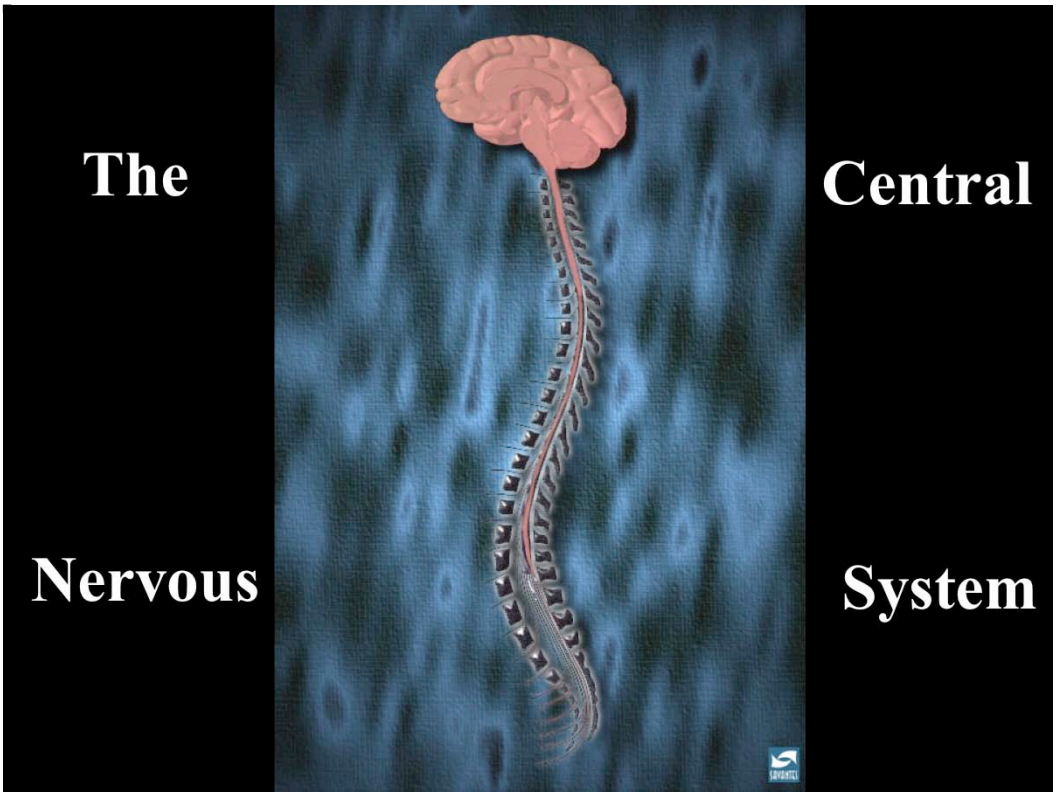
1. Assessment

2. Treatment

3. Relapse Prevention

Relapse prevention is the largest component of quitting smoking.

This series of lectures is aimed at providing you with the knowledge and skills to remain a non smoker.



Pose: the question: Why are some people able to quit smoking tobacco easily while others struggle, experience distressing effects and end up relapsing to smoking?

Explain: A common view was that those who could quit, had a lot of *will power* and self control. Those who could *not* quit, were thought to be weak willed and lacking self discipline.

Ask: the patient: do you think this is true?

Answer: We know this is *not* true.

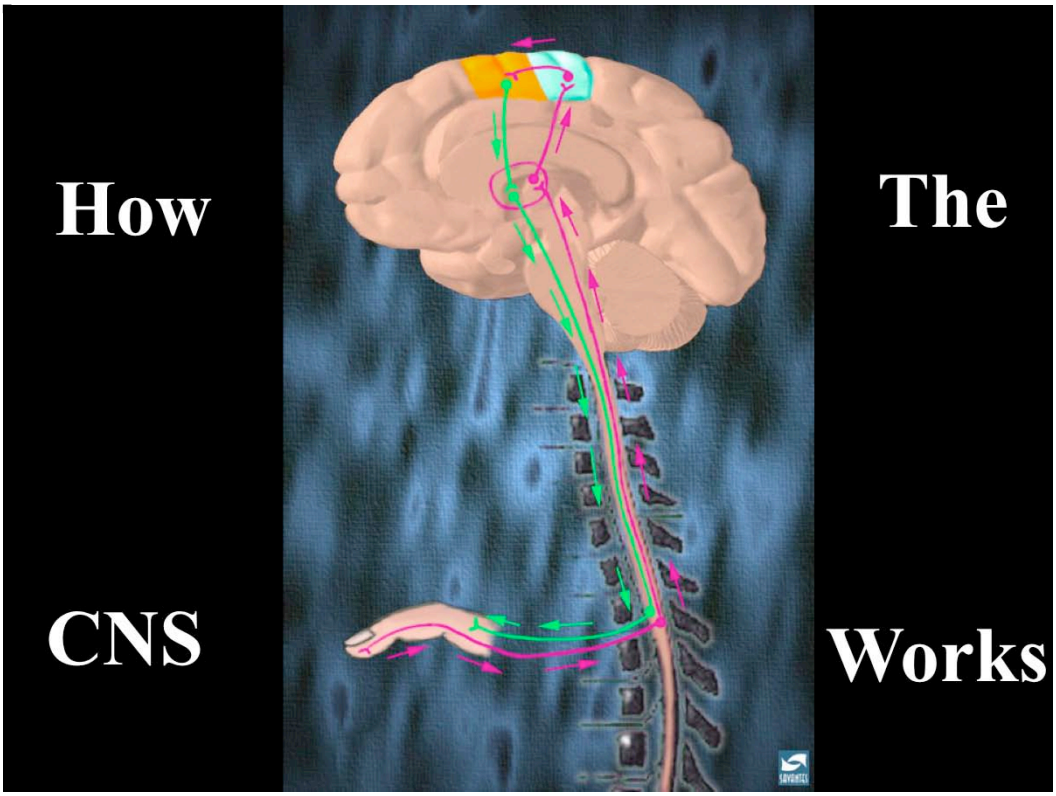
Emphasize: Smokers are all different. Differences in ability to quit are determined *not* by personality factors but by *biological* factors.

Explain: the biological factor which impacts ability to quit smoking is called *Nicotine Dependence*.

State: that nicotine dependence is a disorder of the Central Nervous System.

Explain: That the central nervous system consists of the brain with its neurons, the spinal chord and all the nerve cells which run along and from the spinal chord out to the body.

Describe: the brain as a functional unit consisting of *billions* of nerve cells that communicate with each other using electrical and chemical signals.

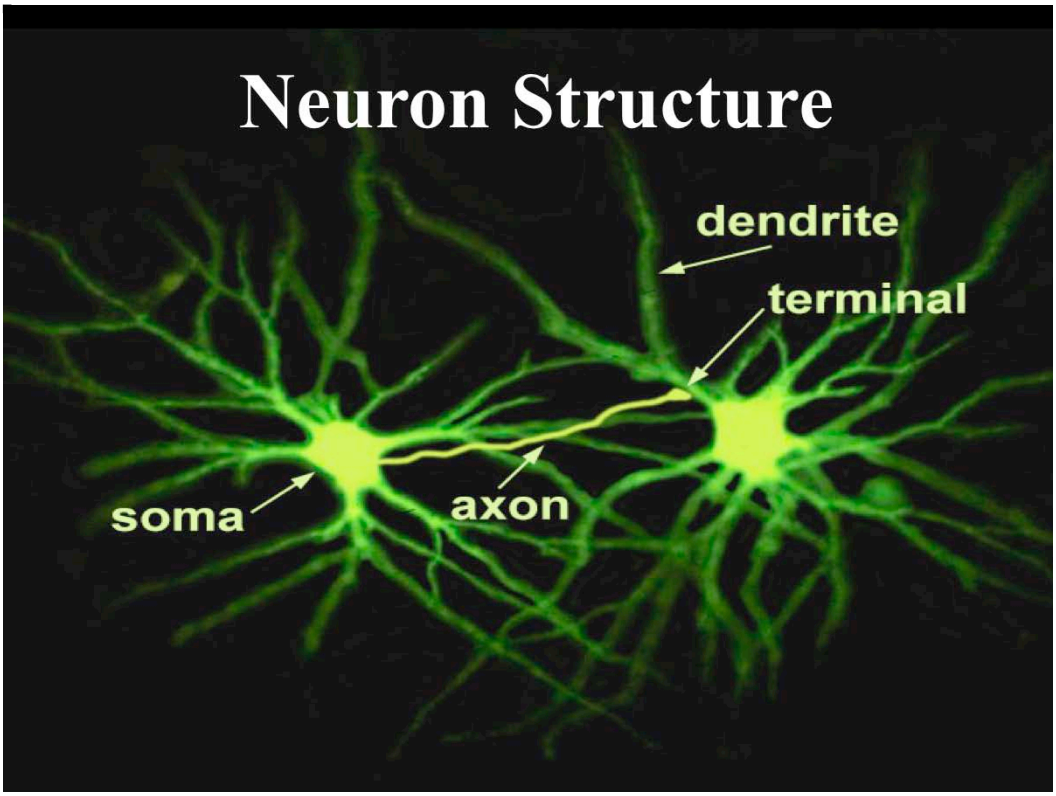


How the CNS Works:

State: the CNS is the control centre of the body.

State: that it controls all our *physical, emotional, cognitive* and *behavioural* functioning.

Demonstrate: an example of a basic CNS action eg. moving a finger, moving an arm muscle.



Neuronal Structure

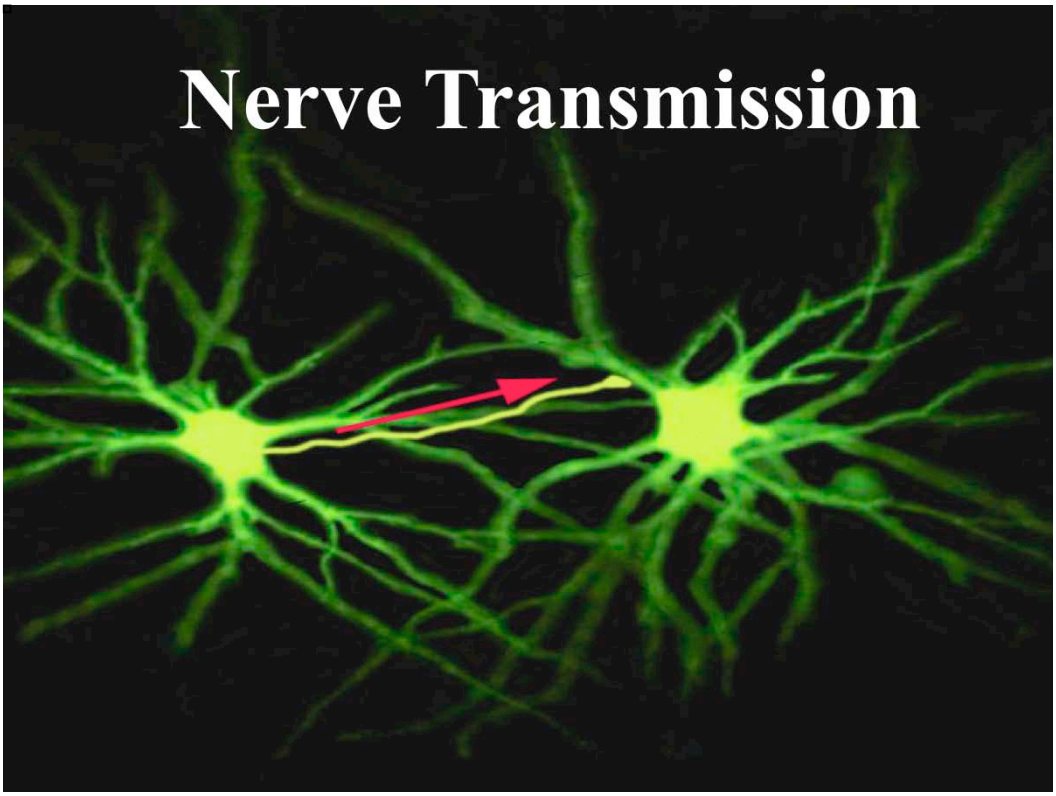
Explain: that this image contains real neurons in the brain. They have been filled with a fluorescent dye and viewed through a microscope.

Describe: the anatomy of a neuron.

Point to the cell body (soma), dendrites and axon.

Explain: the function of each part of the neuron.

Emphasize: that at the end of the axon is the terminal, which makes a *connection* with another neuron.



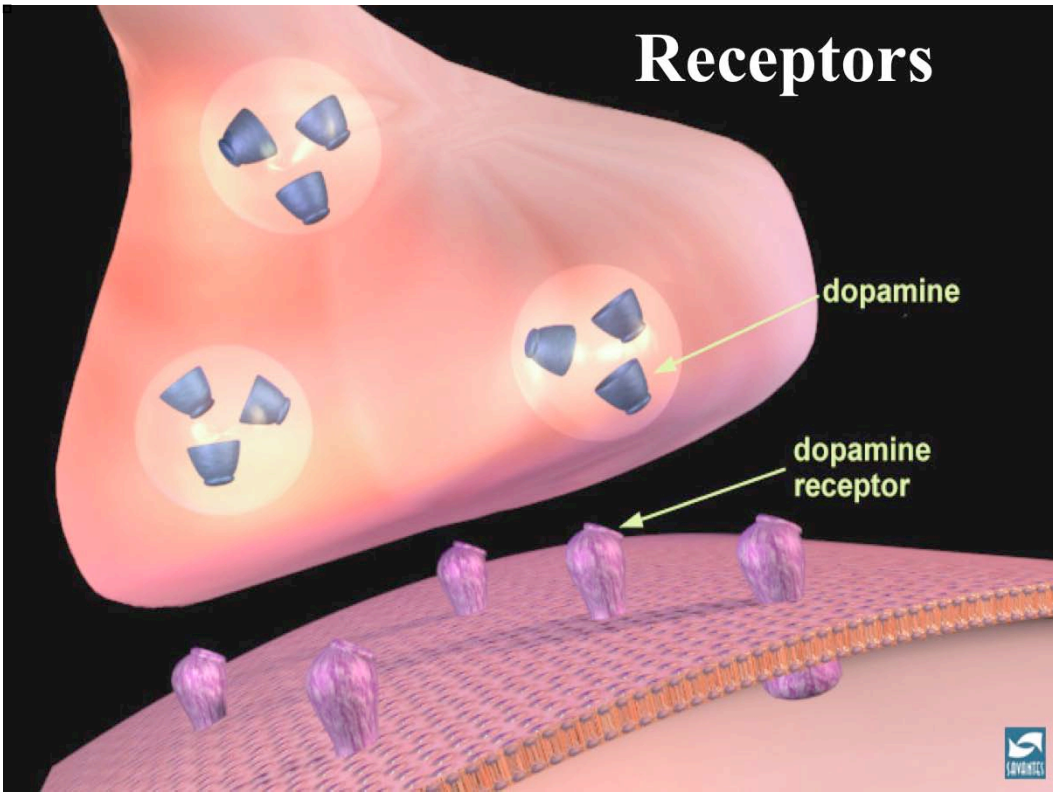
Impulse Flow

Describe: the normal direction of the flow of information (electrical and chemical) along the axon towards the terminals.

Point: to the terminal and show how it makes connections with the dendrite of a neighboring neuron).

State: that the gap between the two is called a *synapse* and this is where a lot of chemical transmission takes place.

State: that synapses (connections) can also occur along other parts of the neuron.



The Synapse and Neurotransmission

State: that this is a synapse.

Explain: that when an electrical impulse generated by the neuron arrives here, it causes the release of chemicals called neurotransmittors.

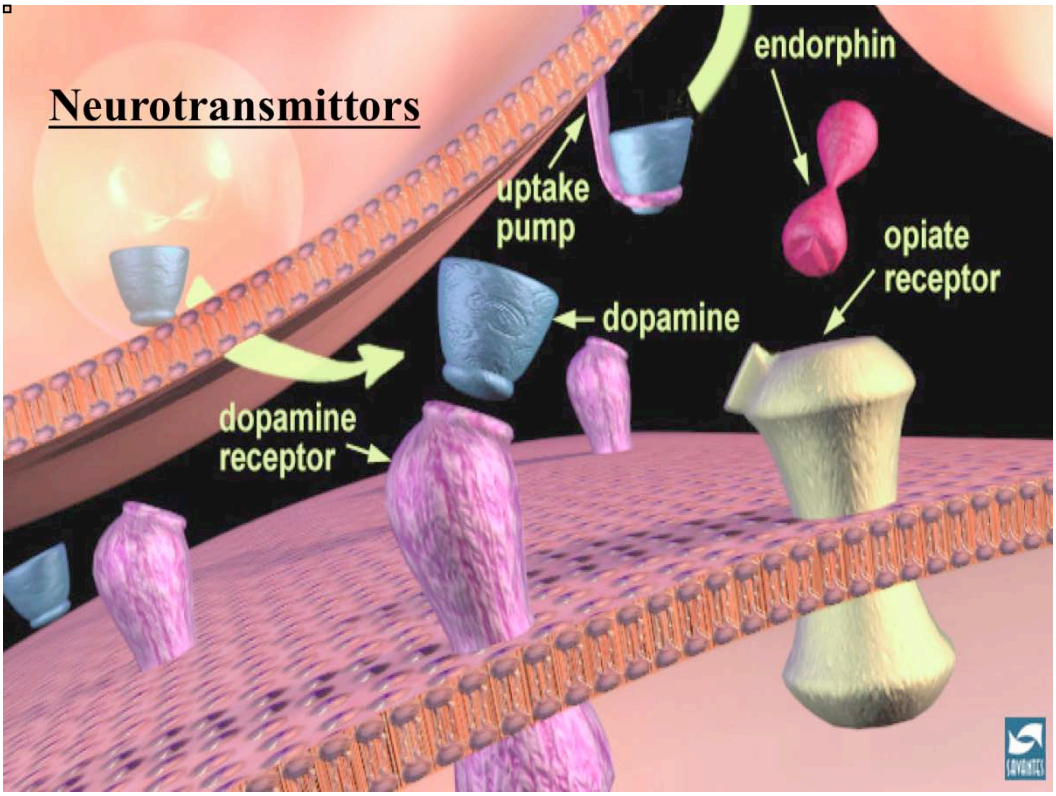
Explain: that a neurotransmittor is a chemical substance produced in the body which is released in the synapse to transmit the message from one nerve cell to the next.

Give: some examples of neurotransmittors: eg dopamine, adrenaline, serotonin.

State: that the neurotransmittor then binds to a point on the nearby neuron called a *receptor.*

Explain: that different neurotransmittors act at different receptor types.

Explain: that the message is then transmitted from one nerve cell to the next.



Neurotransmittors

State: that neurotransmittors released in synapse, occur naturally in the body and different ones act on different receptors.

State: that there is another very efficient and effective naturally occurring neurotransmittor which some people are able to use in their brain ie nicotine. Nicotine is a pseudo neurotransmittor.

Explain: how nicotine enters the brain via smoking. Emphasize the quick delivery of nicotine via the lung into the blood stream (4 seconds) and through the blood brain barrier (7 seconds).

Nicotine is a very good neurotransmittor. It directly impacts physical function, cognition, emotion state and behaviour.

Nicotine also has special receptors on which it acts (nAchR).

Some smokers have a lot of these receptors while others have less.

Compare: how some people smoke more, others less and others can quit really easily while others not. It also modulates other neurotransmittor systems.

Not every one is able to use nicotine in the brain in this way. Thus ability to quit is not determined by personality or will power. Due to nicotine dependence which is highly heritable.

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WHY DO PEOPLE SMOKE?

To administer **NICOTINE** into the blood stream and ultimately into the brain.

Ask: the patient why they smoke.

Discuss: the patients response.

Acknowledge: that the reasons given by the patient are certainly legitimate to the patient.

State: that the real reason people smoke is to administer nicotine into the blood stream and ultimately into the brain where they function with it.

Ask: the patient to describe what they would be like if they were instructed to not smoke for 24 hours without taking any tobacco dependence medications.

Discuss: the patient's response.

Relate: the symptoms they describe to the *pharmacokinetics* of nicotine and to *nicotine withdrawal.*

Emphasize: that in treating tobacco dependence, it is very important that nicotine withdrawal is *eliminated* by finding the correct dosage of combination medications to treat tobacco dependence.

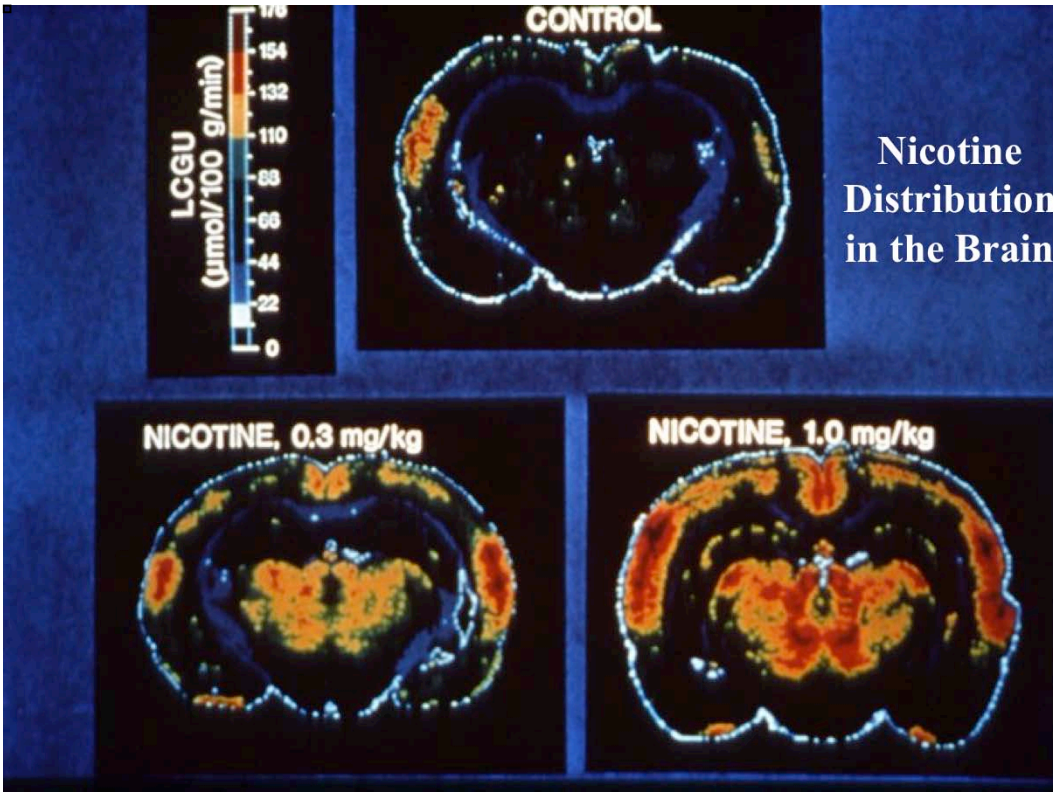
State: That smokers do *not* smoke cigarettes which contain no nicotine.

Highlight: the fact that nicotine free cigarettes are not sold at supermarkets, duty-free airports etc.

State: if nicotine is removed from cigarettes (eg herbal cigarettes), smokers lose interest very quickly.

WHAT HAPPENS TO NICOTINE?

- Broken down (metabolised) by the liver
- Some people metabolise faster than others
- Many positive neuro (brain) chemicals released – many pleasurable but short-acting.



PET Scan of a Smoker

State: that our knowledge of nicotine being taken on in brain receptors is shown by this PET scan.

Advise: Here, the areas of intense red show where the highest concentrations of nicotine are being taken up in receptors in the brain.

Point: to and highlight the concentration of nicotine in the mid brain region.

Highlight: the limbic system.

Explain: its structure and function.

Relate: the high distribution of nicotine here to the affective system, the formation of memories and to pleasure and reward.

Explain: this is how nicotine and smoking become strongly associated with emotions, mood, fond or unpleasant memories and pleasure.

Highlight: the cortical regions, with emphasis on the Pre Frontal Cortex (PFC).

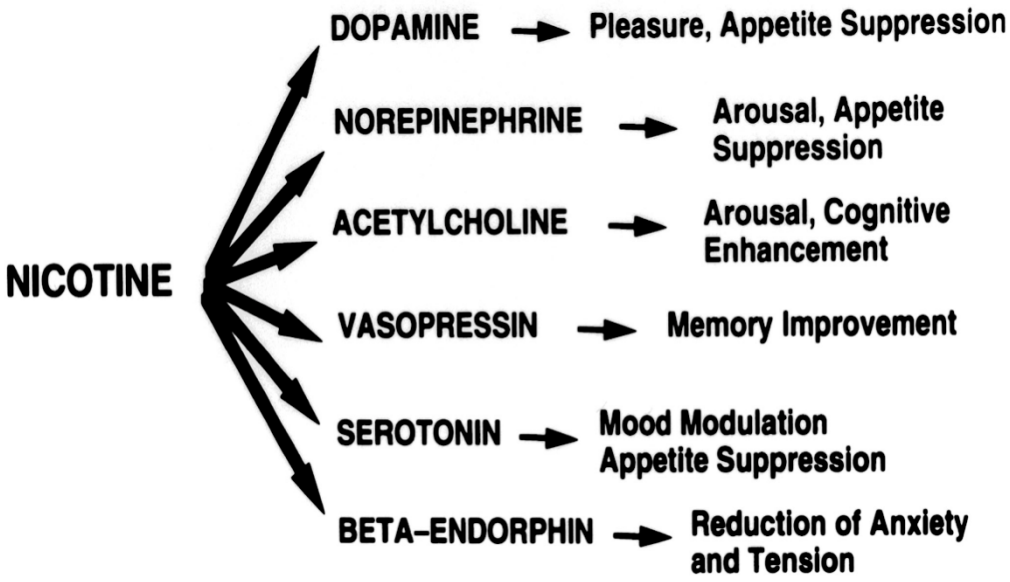
Point: to the high concentration of nicotine in this region.

Explain: the function of the PFC.

Emphasize: that this is where cognition is controlled.

Give: some examples of cognitive functions: concentration, focus, attention, executive function, decision making.

Explain: this is why many smokers report that smoking helps them to concentrate and to stay engaged in their activities.



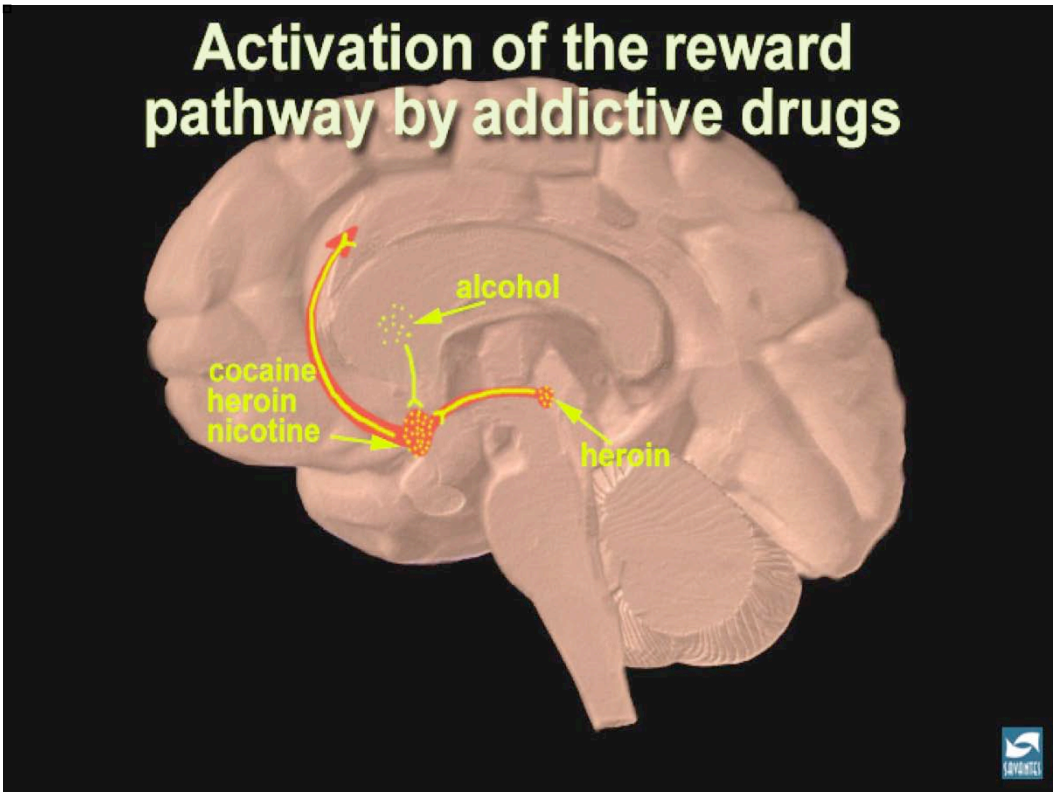
State: that these neurotransmittors, made by the body, are modulated by nicotine.

Emphasise: that like nicotine, these neurotransmittors directly impact physical function, emotional state, cognition and behaviour.

Emphasize: that different smokers will use nicotine in different ways to modulate these neurotranmittors.

Emphasize: that this is why some medications for tobacco dependence work for some patients but not for others.

Emphasize: that it highlights why there is no *"quick fix"* and *"one treatment fits all"* in treating tobacco



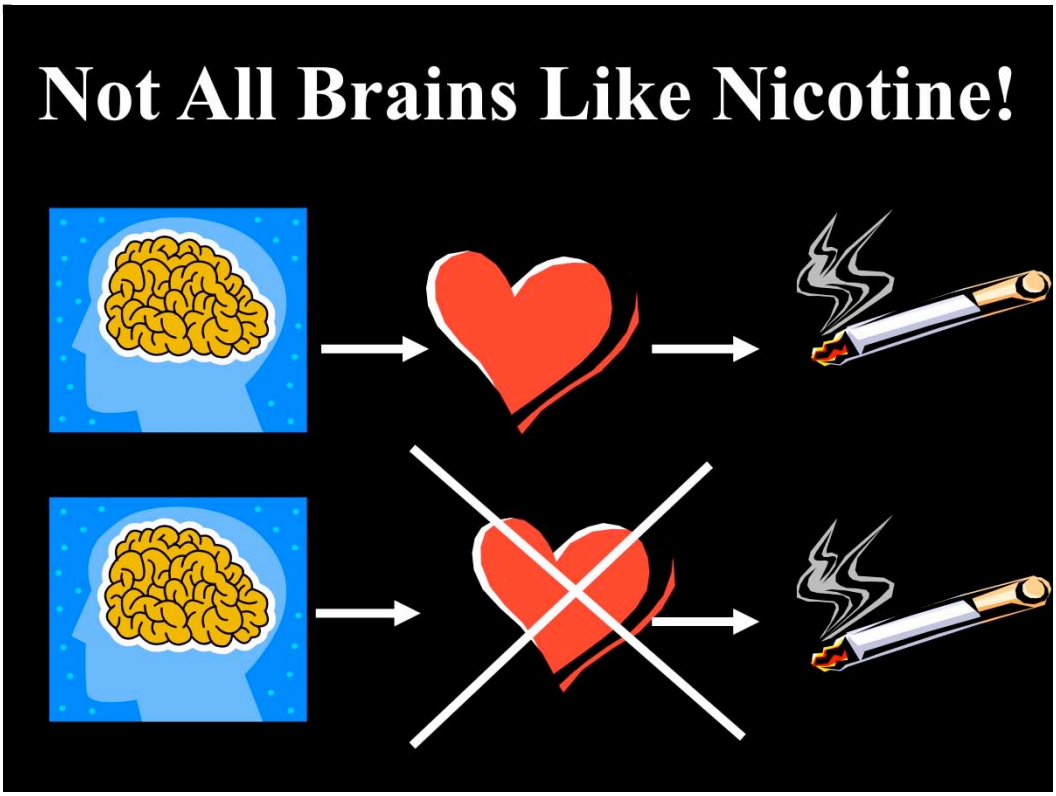
Nicotine and the Reward Pathway

Acknowledge: that many smokers really do enjoy smoking.

Explain: the effect of nicotine in the reward system.

Explain: that nicotine activates dopamine release in the Ventral Tegmental Area (VTA) and the nucleus accumbens (NA).

Emphasize: dopamine provides a sense of pleasure and well being.



Explain: that nicotine is a very short acting drug.:

Advise: that Nicotine does not stay in the blood stream or brain for very long.

It has a half life in the blood stream of 40 minutes to 2 hours.

On metabolism in the liver, nicotine is converted to cotinine which is excreted in urine approx. 36 hours after smoking.

Discuss: variability in smoking effect on individuals:

not everyone who smokes as an adolescent becomes an adult smoker.

Nicotine dependence is highly heritable.

Genetic predisposition to responses in the brain to nicotine (similar to alcohol).

NICOTINE DEPENDENCE

Nicotine dependence is a **chronic disease** with periods of **remission** and **relapse** which warrants ongoing **medical** treatment as do all other diseases and drug dependencies

U.S Surgeon General, 2000

Those who continue to smoke in the face of public health campaigns and in the face of adversity, are doing so not because they are weak willed, but because they have Nicotine dependence.

Explain: that nicotine dependence is a disease. Emphasize the chronicity of the disease and that it requires ongoing treatment and management just as many other medical disorders do.

DSM 1V CRITERIA FOR DRUG DEPENDENCE

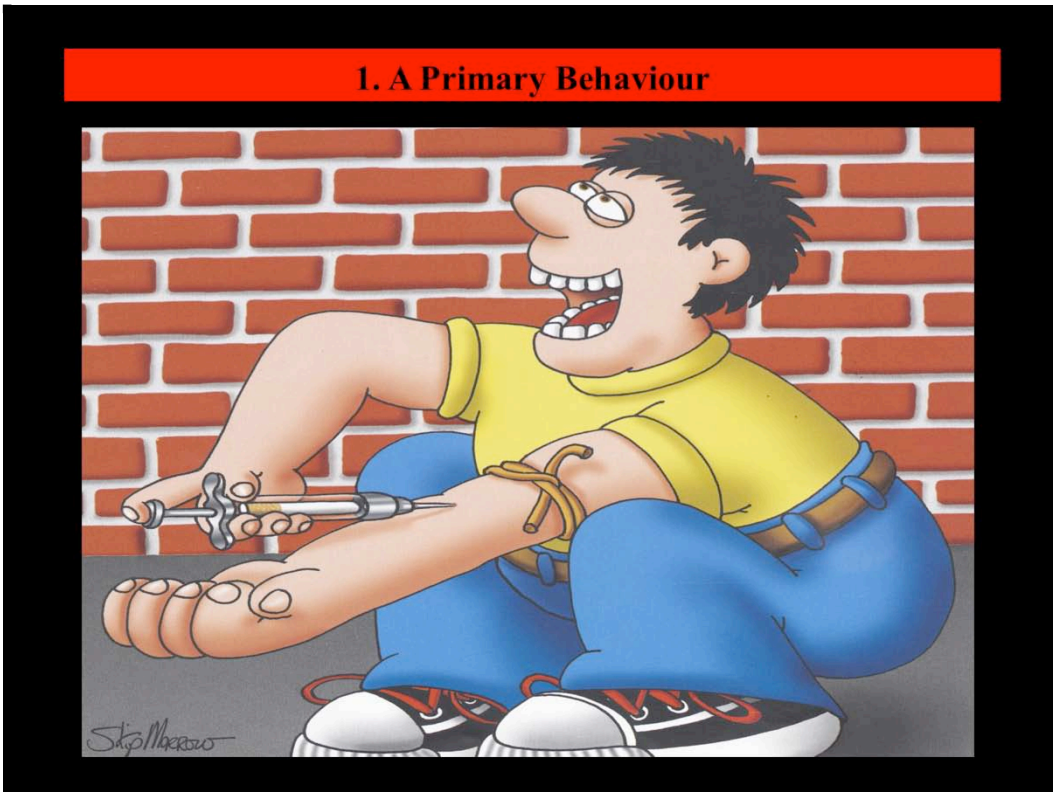
Use of the drug is:

1. A primary behaviour
2. To maintain a blood level to which **tolerance** develops
3. To avoid **withdrawals** → **relapse**
4. In the face of **known** medical and social detriment.

Explain what the Diagnostic 1V and Statistical Manual of Psychiatric Disorders is.

Advise that nicotine dependence is listed in the manual as an official medical disorder.

Therefore smoking is officially a medical disorder and not just a "bad habit".



Explain What Primary Behaviours Are:

Those behaviours which are essential for the survival and well being of the individual. Without eliciting these behaviours, we become very unwell and might even die.

Examples are: eating, sleeping, drinking, sex etc.

When you are dependent on nicotine, the self administration of nicotine becomes a primary behaviour eg. smoking, seeking out cigarette butts to smoke etc.

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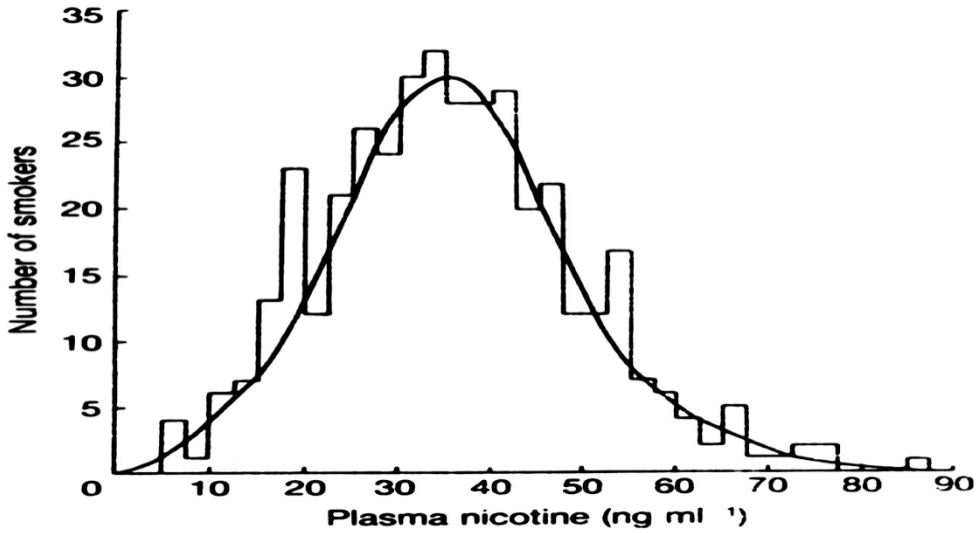
2. To Maintain a Blood Level To Which Tolerance Develops

Criterion 2. DSM 1V Drug Dependence

Nicotine Distribution Curve



Range = 10 - 80ng/nic/ml

Emphasise: that smokers are not an homogenous Group.

Explain the graph: Y axis = total number of smokers

X axis = Blood concentration of nicotine.

Explain: notion of Bell Distribution Curve.

State: There is a lot of variation in blood levels of nicotine from smoker to smoker.

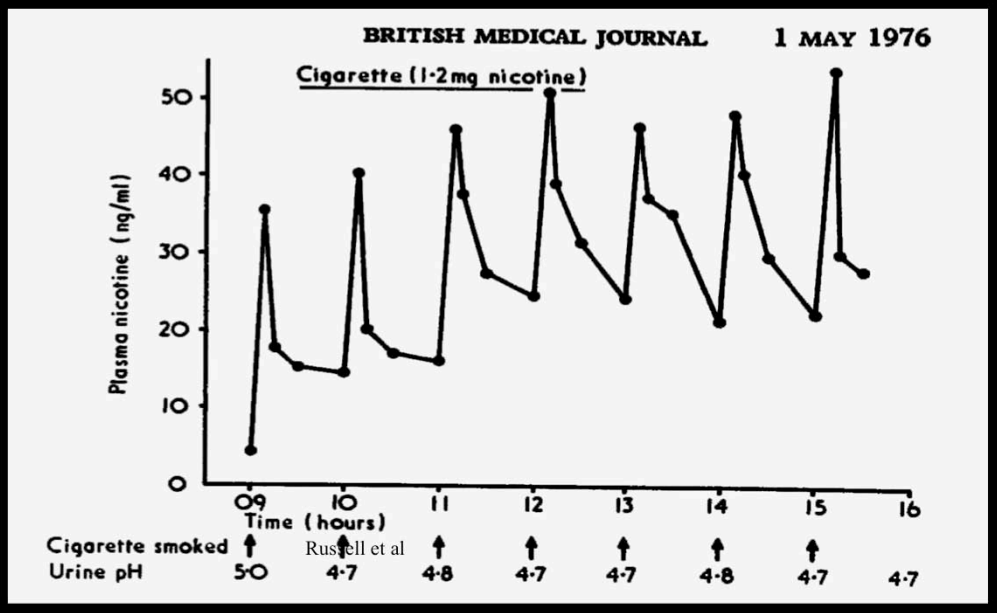
Range = 10 80ng nicotine per mL

This accounts for differences in dependence level.

Highlight average blood concentration of 35 - 40ng nicotine/ mL

Highlight: no one treatment can suit all smokers.

Smoking Blood Levels



Explain: This is a graph of nicotine blood levels from smoking

Explain: y axis = Nicotine blood level (ng/ml)

x axis = Time (hours)

Emphasize: that nicotine is a very short acting drug. That it is delivered very quickly via the lung so that a bolus of nicotine (peak shot effect) is delivered into the blood stream.

The person smokes until they re establish their "happiness" (tolerance) level.

Point to: the troughs of the graph. Indicate that this is where nicotine withdrawal occurs and that the aim of smoking is to re dose on nicotine to take the withdrawal away.

Note: just thinking, wanting, craving a cigarette are all stages of nicotine withdrawal as the person's blood level drops.

ACUTE WITHDRAWALS

- CRAVINGS (urges)
- ANXIETY
- IRRITABILITY
- DISTRESS
- AGGRESSION
- REDUCED CONCENTRATION

Reinforce: that nicotine withdrawal occurs in between every cigarette. ie. Every 40 minutes or so as a smoker.

Reinforce: the aim of smoking is to alleviate nicotine withdrawal.

Advice: on quitting smoking, the first 2 weeks of abstinence is where the withdrawal is usually the most severe.

Nicotine withdrawal can facilitate relapse in the short term.

In the long term, nicotine withdrawal can be triggered by passive smoke exposure.

The idea of combination medications to treat nicotine dependence is so that the patient does not have to experience any nicotine withdrawal.

Combination medications need to be titrated accordingly by the clinician to eliminate nicotine withdrawal symptoms.

MORE CHRONIC WITHDRAWALS

- INSOMNIA
- HYPERSOMNIA
- HEADACHES
- CONSTIPATION
- APHTHOUS STOMATITIS
- INCREASE IN APPETITE (sweet)
- MEMORY LOSS
- DEPRESSION
- RATIONALISING SMOKING

Rationalising Smoking can include mental dialogue such as:

“One won’t hurt”.

“I’ll just have one cigarette. No one will know”.

“Just one puff and I won’t have any more after that”.

“I’ll just have one to prove to myself that I don’t like this any more”.

“I’ll just have one to prove to myself that I can handle this now”.

This is all nicotine withdrawal!! This mental dialogue can be triggered by not taking combination medications as prescribed or by passive smoke exposure (breathing in other people’s nicotine).

WHAT MAKES WITHDRAWALS WORSE?

- Alcohol
- Having smokers near you
- Shortening the treatment

Alcohol is a chemical trigger for smoking as it causes nicotine to be metabolised more quickly. Patients should avoid drinking alcohol for the first 2 weeks of quitting.

Passive smoke – must be avoided for life. Side stream smoke (smoke that comes out the burning end of a cigarette) is very highly concentrated in nicotine.

Emphasize: it is the rate of delivery of nicotine into the bloodstream that causes dependence.

Inhalation (even through passive smoke) is the fastest way to deliver nicotine into the bloodstream and brain.

Passive smoke exposure can trigger nicotine withdrawals (including craving) in the short and long term.

Use the analagy of inhaled nicotine being an "allergy" where the person can start craving again.

Explain: ceasing treatment early can facilitate nicotine withdrawal and relapse. Compare using combination treatments for nicotine dependence to the need to take a full course of antibiotics so the infection does not re appear, in the case of smoking so the craving and withdrawal does not re surface.

WHAT MAKES WITHDRAWALS EASIER?

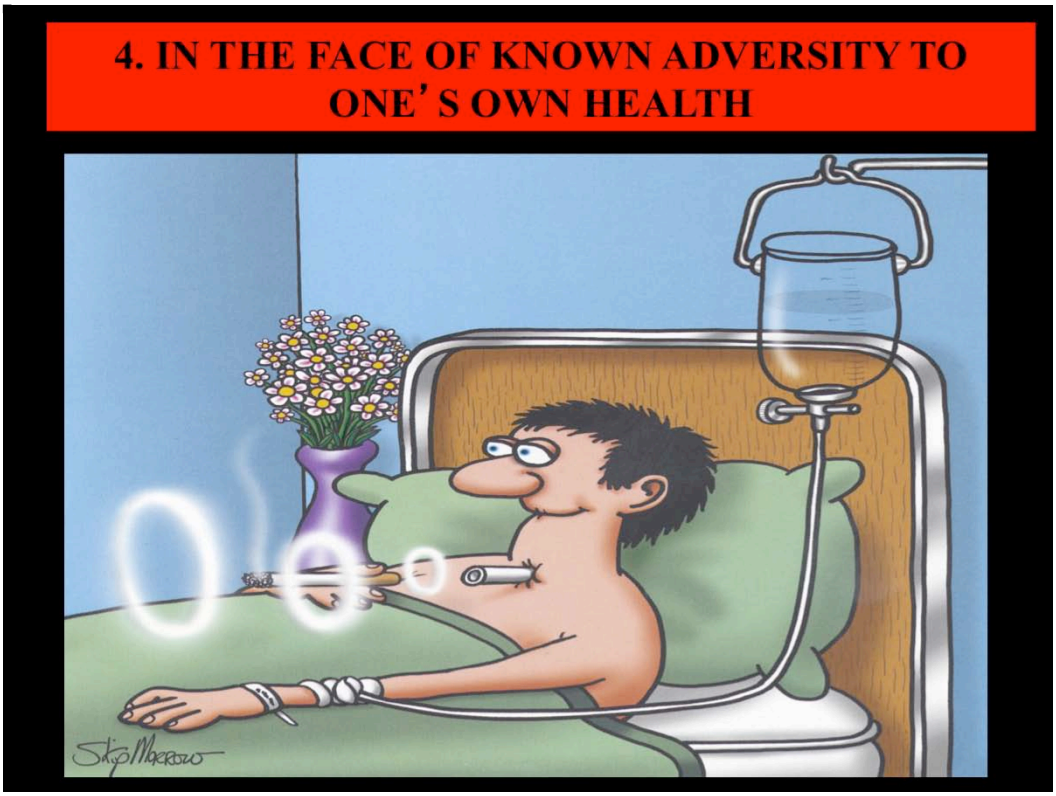
- Living life as normally as possible.
- Not carrying cigarettes on you BUT ke them at home somewhere safe.
- ½ the amount of coffee (or cola) you drink.
- Sugar hits help
- Eliminate smoking by anyone in your home and car

INTERACTIONS

- Caffeine
- Alcohol
- Sugar

Caffeine – (including colas) smokers need twice as much for the same blood caffeine levels. Reducing BUT NOT ELIMINATING caffeine intake by ½ to avoid caffeine toxicity (symptoms are similar to nicotine withdrawals). Eliminating caffeine altogether may cause caffeine withdrawals.

Blood sugar increases with a cigarette – smoking is like having dessert. Sugar hits help with withdrawals- eg jelly beans, grapes.



DSM IV Criterion:

Continuing to smoke in the face of:

- **graphic media Campaigns**
- **increase in price**
- **decreasing access to**
- **decreasing social desirability**
- **Personal medical adversity**

is a sign of dependence on nicotine

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COMPARING POTENTIAL FOR DEPENDENCE

- Alcohol 1: 20
- Heroin 1: 5
- Nicotine **1: 3**

Emphasize: nicotine is more addictive than both heroin and alcohol mainly because it is much shorter acting but also because the delivery mechanism is very fast.

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TOBACCO SMOKING PREVALENCE/ AUSTRALIANS 18+

1945	45%
1992	26%
2001	19%
2004	17%

“The current population of smokers is becoming harder to treat (Bittoun, 2004)”

Emphasize: the prevalence of smoking in Australia has dropped dramatically over the last 60 years.

This has been largely due to public health campaigns.

As the prevalence has dropped, population of smokers left tends to be more highly dependent on nicotine and more difficult to treat.

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CONCLUSION

All smokers have a <u>right</u> to the evidence based treatment of nicotine dependence

Reinforce: tobacco dependence is a disease. Smoking is not a bad habit or weakness of will. Smokers have a right to the treatment of this disease just as they do with all other diseases.